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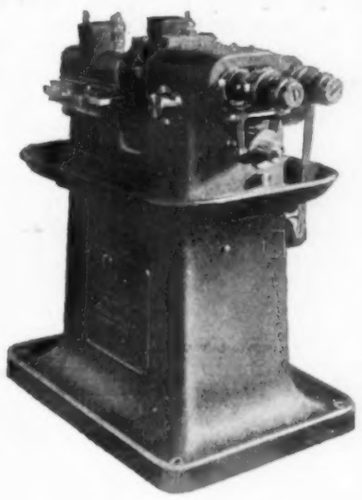
THE TRUNDLE AUTOMATIC THREAD MILLING MACHINE

By FRED H. COLVIN
Principal Associate Editor, *American Machinist*

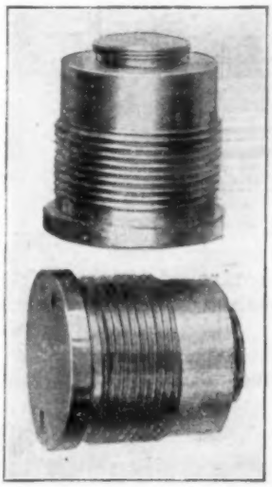
This thread-milling machine is the commercialized development of a special machine designed before the entrance of this country into the war, for the purpose of catching up with the production schedule on foreign munition contracts. It performed so well on work of this nature that there seemed to be a wide field for it in general manufacturing and it has been re-designed for that purpose as described here.

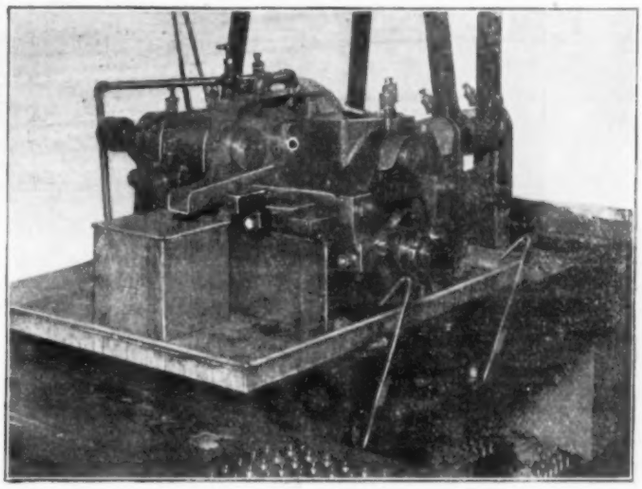


IN 1915 the American Multigraph Co. was making primer bodies for the British and Russian governments. The external body thread on this piece, Fig. 1, must be very accurate and its cutting was a problem that was only solved by the invention of the special machine shown in Fig. 2. Several months were used up in attempts to do this job on an automatic screw machine but it was found that in order to produce accurate work the screw machine could only be used for roughing, finishing being done by hand. This was both tedious and expensive and it was very difficult to secure the proper dies.

In order to meet deliveries a standard thread-milling machine was purchased. This machine did beautiful work but its maximum capacity was only 1500 pieces in 21 hours. The initial tooling expense to use these machines for an output of 40,000 per day seemed entirely too high to be warranted. The chief engineer, George T. Trundle, Jr., got on the job and his efforts resulted in the machine already mentioned. His first machine turned out 10,000 pieces in 21 hours and it was only necessary to build three more to take care of the contract.

When we got into the war this company was able, with the Trundle machines, to handle with ease threaded jobs similar to the one shown, for both the army and the navy. With the end of the war contracts, arose the same problem which every one else was facing—what to do with its special machinery. In this case it was solved by the General Metals Co., of Detroit, which had built several of these milling machines for the Multigraph Co. It secured the exclusive rights to manufacture and sell them and then set to work to redesign them for commercial uses. This work has just been completed and the new product is ready for the market as described in the following paragraphs.





FIGS. 1 AND 2. THE ORIGINAL MACHINE AND A SAMPLE OF ITS WORK

The headpiece and Fig. 3 show two views of the redesigned machine in which several changes have been made. In following out these developments, particular care was taken to make the device as practical a shop tool as possible by reducing the time required for changing set-ups as much as possible—to 10 min. in most

cases. The shops where manufacture is being undertaken are thoroughly up to date in equipment and methods for producing accurate work, and only first-class machinists are employed. The claim is made that this machine is the only multiple-spindle automatic thread-milling machine on the market.

The column is made of machine grey iron cast in one piece. As will be seen in the headpiece there is a ball-thrust bearing is fitted and all the operating cams are keyed to this shaft.

In front of and outside the bed is the drum-type lead cam, Fig. 4, beneath the saddle the cross-table cam, and at the rear the drum cam which actuates the collet mechanism *D*, Fig. 3. The shaft is driven by a worm on the cross-drive shaft through a bronze worm gear which is mounted loosely on the shaft and engaged by means

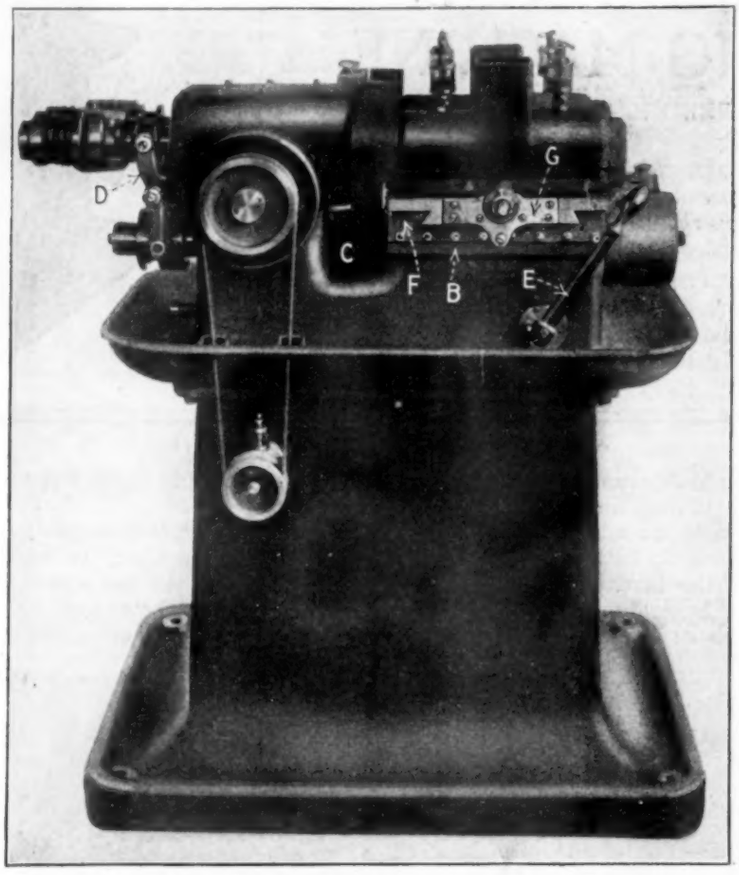


FIG. 3. SIDE VIEW OF NEW MACHINE

door in the side for the convenient removal of chips and the replacement of coolant, and the flared base has an up-turned flange to catch spilled oil. The column is machined top and bottom and contains a rectangular coolant can with a spill can, both of which may be removed through the door.

The cast-grey-iron oil pan is also machined above and below and entirely surrounds the column. Provision is made to drain the coolant into the spill can inside the column. Two openings are cut through for the pump belt and their sides are built up as shown at *A*, Fig. 3, to hold the coolant and to protect the belt.

The bed of the machine is finished on the bottom to make a close fit with the finished upper surface of the pan and both are fastened to the column by six cap-screws. The front of the bed *B* is scraped to receive the saddle and back of this is a two-way incline *C* cast in the bed to direct the fall of the finished parts and the used coolant. Back of and above these inclines are two bored holes for the work spindles and below them at right angles are the holes for the cross-drive worm-shaft.

The main shaft is made of chrome-nickel steel, heat-treated and ground, 1¾ in. in diameter by 34 in. long. It extends through the bed from front to rear and runs in tapered bronze bushings which may be taken up. A of a pin clutch controlled by the safety lever *E*. The safety lever is ordinarily used only when setting up the machine.

The sliding tables include the main saddle *F* which slides in dovetailed ways in a direction parallel to the axes of the work spindles through a distance equal to the pitch of the thread to be milled. The cross-table *G* slides in dovetailed ways in the saddle at right angles to the saddle travel. It is operated by a cam on the main shaft which moves a pair of adjustable rollers mounted in arms extending down through the saddle, bringing the cutters into action alternately.

The drum cam *A*, Fig. 4, controls the travel of the saddle and is in a position where it can easily be changed when a thread of different lead is to be cut. As there are two work spindles each delivering a finished piece for one revolution of the main shaft this cam has two lead surfaces exactly alike and producing a motion of the saddle exactly equal to the lead of the thread being milled. The return surface is a relatively abrupt offset which returns the saddle quickly. Various sets of cams and cutters may be employed for various forms of work.

The accuracy of the cam grinding is reflected in the accuracy of the finished piece. To prevent the entrance of foreign particles, the cam is protected by a cast aluminum cup.

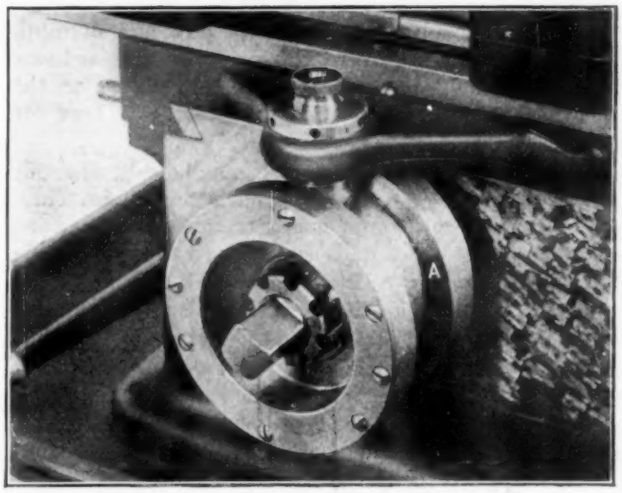


FIG. 4. END OF SADDLE AND DRUM CAM

The two cutter heads *A* and *B*, Fig. 5, can be independently adjusted laterally in dovetailed ways on top of the cross-table. The lateral motion is obtained from long screws with squared ends *C* and *D* and micrometer heads graduated to give an adjustment to 0.00025 in. in the diameter of the threads being cut. The heads are locked by tightening V-shaped gibs which bear against the sides of the dovetailed slots.

The two cutters *A*, Fig. 6, one in each head, are not hobs but are made up of a series of single milling cutters spaced according to the threat pitch and having teeth in planes perpendicular to the cutter axis. The shape of the cutting teeth depends on the kind of thread to be cut. Each cutter is mounted in a hardened and ground chrome-nickel-steel spindle which passes through a large spindle made of the same material and running in adjustable bronze bushings. The inner spindle can be adjusted longitudinally in the outer spindle to which is attached the driving pulley. The cutter has a B. & S. taper shank and is held in by a long draw bolt. The protecting guards are shown in position in Fig. 3.

The heat-treated and ground chrome-nickel-steel wormshaft runs in SKF ball bearings at right angles to the main shaft and work spindles. On it are three worms which drive the main shaft and the work spindles through bronze worm gears.

The two work spindles are bored out to take the collet operating tubes which have an inside diameter large enough to take 1-in. stock. They are provided with means for longitudinal adjustment.

The work chucks *E* and *F*, Fig. 5, are of the draw-in collet type and may be made expanding or contracting to meet special conditions. They are operated automatically by tubes controlled by the finger clutches *B* and *C*, Fig. 6. The clutch is actuated by the yoke lever *D* which ends in a roller working in a drum cam on the end of the main shaft. The chucks open alternately so that one may be filled while the other is in cutting position.

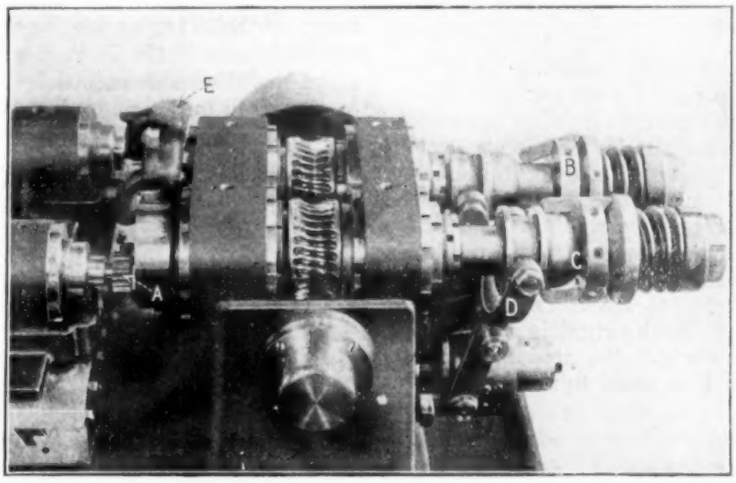


FIG. 6. VIEW SHOWING COLLET CLUTCHES AND WORM GEARS

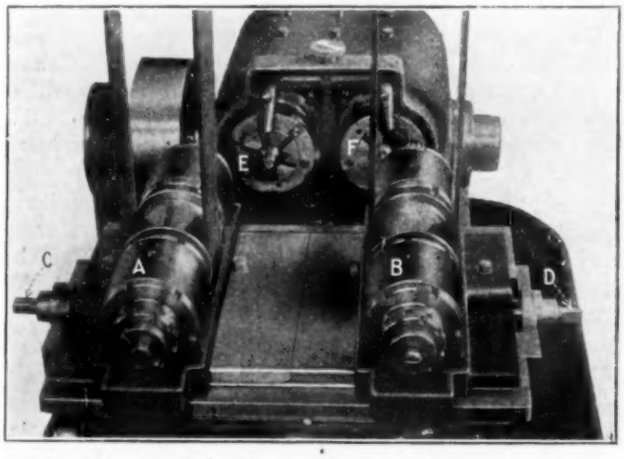


FIG. 5. VIEW SHOWING CUTTER HEADS AND CHUCKS

The sliding surfaces are lubricated through covered oil holes. The cutter spindles have sight-feed oil cups fitted with equalizing tubes and the work spindles and worm gears are taken care of by spring-cap oil cups on the covers. The pump shaft also has spring-cap oil cups.

The coolant is delivered by a centrifugal pump of the nonclogging type through pipes direct to the cutters. The pump and as much of the piping as possible is located inside the column to protect it and improve the appearance of the machine. The delivery spouts fit into tapered holes in the pipe so that they can be set at any angle and the flow is controlled by a large threaded stud with knurled top *E*, Fig. 6.

A special countershaft is furnished with the machine, fitted with SKF ball-bearing hangers. There are six pulleys, each 12 in. in diameter, two tight to the shaft and four loose. Two of the four loose pulleys are fastened together and the others are idlers. One of the two drive belts from the main shaft runs to a tight pulley on the countershaft and the other to one of the

joined loose pulleys. From the other tight pulley an endless belt runs down to one cutter spindle, up over a small idler suspended from one of the hangers, down to the other cutter spindle and back to the tight pulley. Another belt runs from the other joined pulley to the cross-shaft pulley. With this arrangement the speed can be controlled by the size of pulleys on the line shaft.

The operation of the whole machine being automatic, the operator has nothing to do but fill the collets, his speed being determined by that of the machine. This

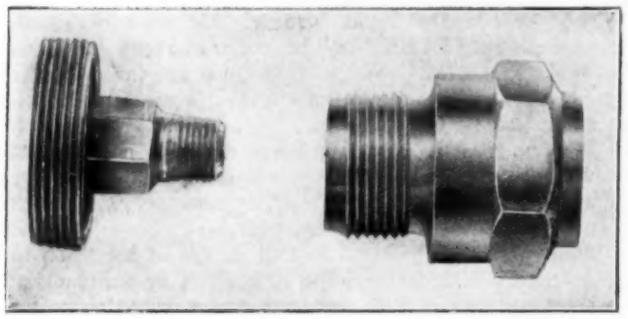


FIG. 7. TWO SAMPLES OF WORK DONE. PRODUCTION ON LEFT-HAND PIECE IS 300 PER HOUR, ON RIGHT-HAND PIECE 530 PER HOUR

naturally results in a considerable speeding up of production as it reduces the opportunities for lost time.

The machine will handle 1-in. rods through the spindle and the chucks will grip the outside of pieces 2 in. in diameter or the inside of pieces up to 3 in. in diameter. The projected floor space is only 28 x 40 in. and the height 46 in. The net shipping weight is 1900 lb.

Two samples of work being done on these machines are shown in Fig. 7. At the left is a grease-cup bottom made of dead soft-drawn steel stock. Production of this piece is 300 per hour. At the right is a spark-plug shell of cold-rolled steel on which the production is 530 per hour. It is expected that these figures will be increased.

What's in a Name?

BY SANDY COPELAND

A letter written by L. L. Thwing, appearing on page 632 of *American Machinist*, leads one to believe that he is somewhat puzzled by some of the names applied to various machines, machine parts and appliances; he inquires, "What's in a name?" and then proceeds to demonstrate that there isn't much of anything in it.

I don't know any more about a machine shop than Mr. Thwing does, and he doubtless knows quite as well as I what are the *right* names of most things regularly found in them, but he overlooks the fact that a fellow who doesn't know the name of a thing is likely to call it by any name but the one that belongs to it.

It is as easy for some folks to name things in a machine shop as it is for others to name a strange dog, or a waiter in a restaurant. The "machinist" who called a driving plate a "screw-chaser" was probably a wartime machinist; and while a "cherrying attachment" may *possibly* have something to do with a "cherry," or ball-mill, it is quite as likely to refer to a cock-tail mixer as Mr. Thwing suggests.

Mr. Thwing's bewilderment is due not so much to what is in a name as to what is in the namer. The man who designated as "geared head" a machine supplied with an ordinary stepped cone, probably carried the real geared head under his hat.

The difference between index centers and dividing head to my mind occurs at the point where the index plate is taken off the main spindle and placed on the wormshaft, but there is abundant opportunity here for difference of opinion.

A "collet" holds but one size. It may be split or solid; and if the latter, the hole may be parallel or taper. Thus, we have spring collets, taper collets, and screw-machine collets (which are not of necessity used in a screw machine). If a spring collet holds more than one size, it becomes a split-chuck—oftener called a step chuck.

A vise has a pair of jaws, one of which is fixed and the other moved by a screw or screws. It is used to hold parallel or tapered pieces whenever it is desirable to hold such pieces, and is usually designated by the place where it is used, as bench vise, portable vise, shaping-, planing-, drilling- or milling-machine vise, etc. I am aware that these latter are frequently called "chucks" but that does not make them so, any more than calling sawdust "breakfast food" makes it good to eat. Chucks are for holding round or irregular pieces; they usually have three or more jaws, and are made so they can be revolved.

The difference between helical and spiral gearing is easy: A helical gear has its teeth wrapped around its circumference in the form of a helix; the spiral gear—there "haint no such animal." A spiral is a clock spring or the scroll in a scroll chuck, and I never saw teeth in either of them.

Regarding the double- and triple-back gears, I will pass and ask for a new deal. Why not call them quadruple? There are four of them at the least.

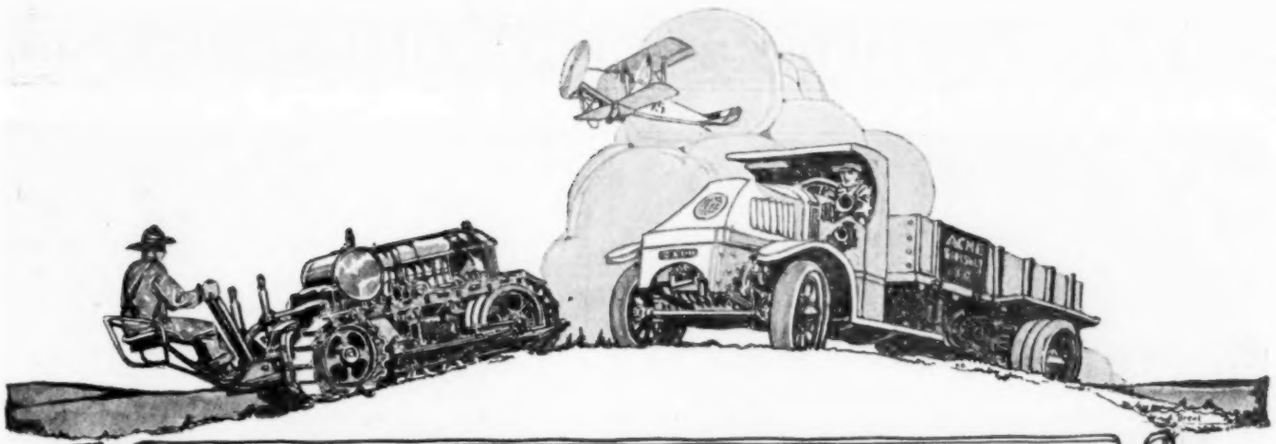
Mid-West Sections of the A. S. M. E. Meet at Indianapolis

Two very timely subjects, Industrial Unrest and Industrial Research, were taken up at the joint meeting of the mid-western sections of the American Society of Mechanical Engineers which was held at Indianapolis, Oct. 24 and 25. Dean Richards, of the University of Illinois, presided at the Industrial Unrest session and papers were read by Maj. W. C. Rogers of the Employers' Association of St. Louis; C. F. Scribner of Chicago, consulting engineer; A. D. Bailey, Chicago Commonwealth Edison Co.; Dr. J. A. Watkins of the University of Cincinnati, and Prof. B. W. Benedict of the University of Illinois.

On Friday evening a banquet was given at which Charles F. Coffin, president of the Indianapolis Chamber of Commerce, made an address of welcome which was responded to by President Cooley of the A. S. M. E. The principal address was made by Dr. Willis A. Moore of Cincinnati on "Doing the Impossible."

Professor Greene of Rensselaer Polytechnic Institute presided at the Research session at which papers were read by C. F. Hirshfield, Detroit Edison Co.; L. G. Robinson, Cincinnati; Prof. H. F. Moore, University of Illinois; Dr. E. P. Hyde, Nela Park Laboratories, Cleveland; Dean Benjamin and Professor King, Purdue University; G. S. Hessenbruch, St. Louis, and Dean J. R. Allen, director of research, A. S. H. and V. E.

Visits were made to a number of the largest industries of Indianapolis and the usual automobile trips and entertainments were provided for the ladies.



AUTOMOTIVE CONSTRUCTION

Some Details of Motor-Truck Building

By FRED H. COLVIN
Principal Associate Editor *American Machinist*

While the truck here illustrated is one of the best known, the number produced is not large enough to warrant mass-production methods in all departments. There is, however, much to be learned by studying the methods of this shop, as it is one of the pioneer motor shops of the country and has developed many interesting features.

THE accompanying illustrations show some of the details of the finishing of Riker motor trucks, as seen in the shops of the Locomobile Co., Bridgeport, Conn. Figs. 1 and 2 show some of the finishing touches in the way of machine operations, being put on a truck frame by means of the double-arm radial-post drill. These views give a good idea of the construction of the frame, showing its deep side members, the substantial cross-bracing, and the way in which the different brackets are attached. They also show the way the frame is handled and the kind of shop trucks used for this purpose.

Some details of the cast-steel wheels demanded by Government specifications are shown in Figs. 3, 4, and 5. In Fig. 3 the holes are being drilled for the brake drums, this view showing the drilling fixture with its removable top *A*, the double T-headed bolts *BB*, and one of the trunnions *C*, by which the fixture can be easily lifted by the crane.

This also shows how the fixture is mounted on the movable table *D*, which can be moved along the track *E* so as to bring the work under the drilling spindles. The latch *F* holds the table against accidental movement while being drilled.

After the side holes are drilled, the wheel is mounted, as shown in Fig. 4, under a substantial vertical drill with a double-spindle attachment. This is for drilling the holes for the skid-chain attachment on the inside of the rim. The method of holding the wheel on the mandrel by the open washer is readily seen.

Fig. 5 shows the hydraulic press for forcing on the 36 x 5-in. double truck tires. It also shows one of the wheels complete with the brake drum in place on the inside and the skid-chain hooks in position.

Beginning with the assembly of the trucks, we have a pile of front axles and springs in Fig. 6. The axles have the steering knuckles in position and the springs

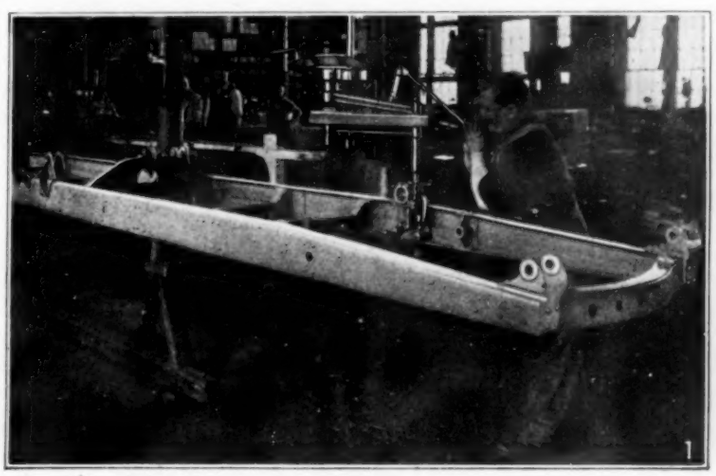


FIG. 1. DRILLING FRAME FOR BRACKETS

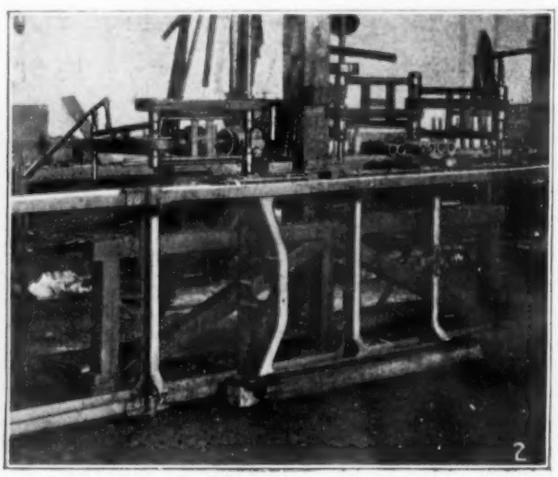


FIG. 2. SIDE DRILLING WITH FIXTURE

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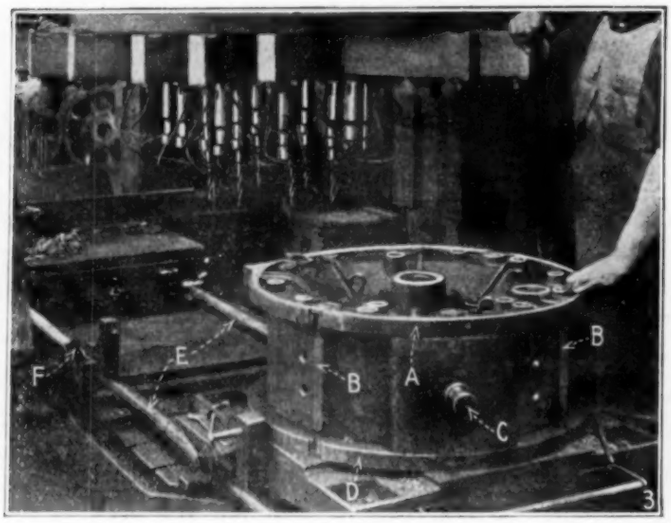


FIG. 3. DRILLING BRAKE-DRUM HOLES

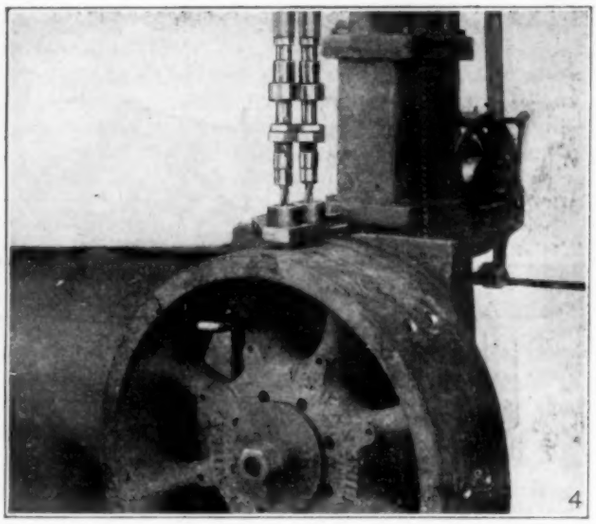
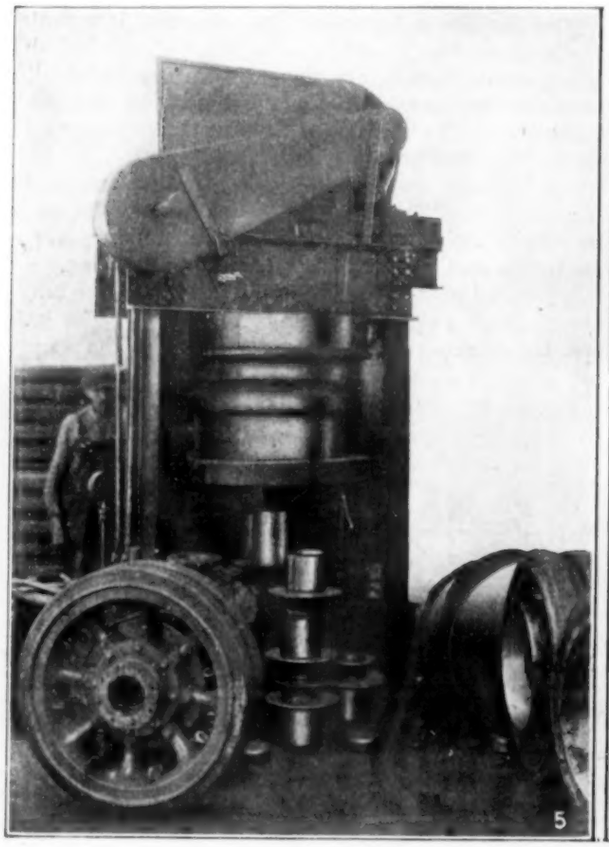


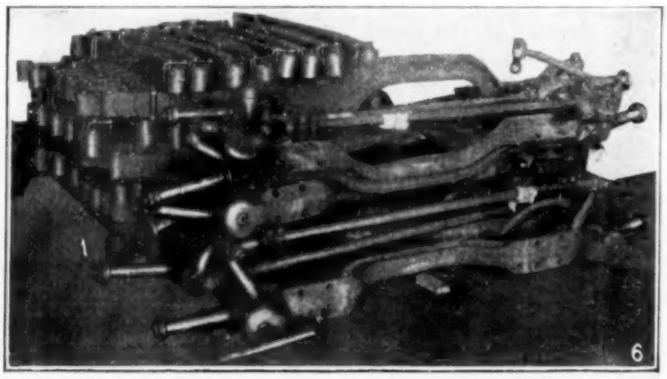
FIG. 4. DRILLING FOR SKID-CHAIN HOOKS

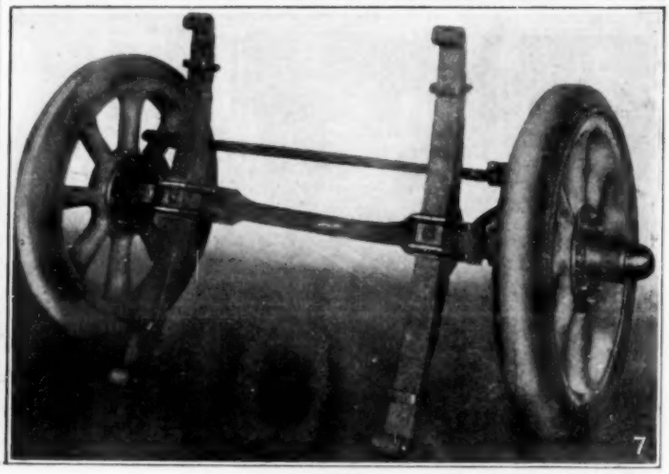
have already been fitted with their bands and bushings. In Fig. 7 the front-axle assembly is complete and ready to be mounted under the truck frame.

The rear-axle assembly is shown in Fig. 8, ready for the mounting of the wheels. This shows the roller bearings, the brake band and lining, the spring, rear-axle worm drive, and distance pieces, the whole sub-assembly being mounted on special wooden jacks. The wheels are not generally put on until the rear axle is in place under the truck frame. In Fig. 9 the four-cylinder motor has been put in position in the front end of the frame, and the transmission box will be seen in place between the two cross-members behind the motor.

A good general view of the erecting shop can be seen in Fig. 10, where a number of trucks are practically assembled on the right and already have their testing load of pig iron in a suitable tray which is easily han-







FIGS. 5, 6 AND 7. PRESSING TIRES ON WHEELS, FRONT-AXLE AND SPRING SUB-ASSEMBLIES AND FRONT-AXLE COMPLETE

AUTOMOTIVE CONSTRUCTION

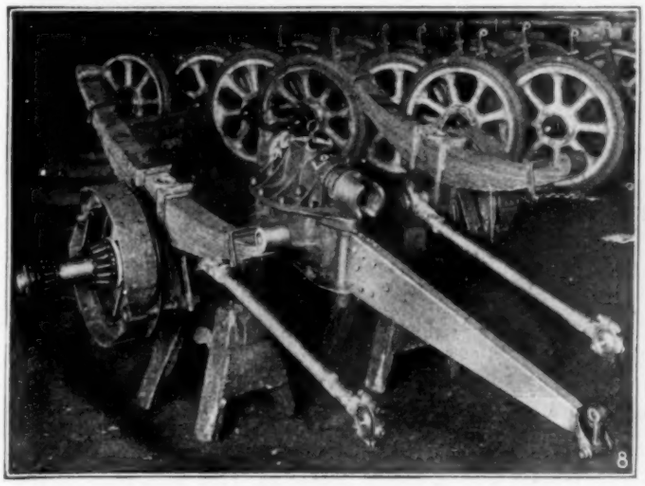


FIG. 8. ASSEMBLING THE REAR AXLE

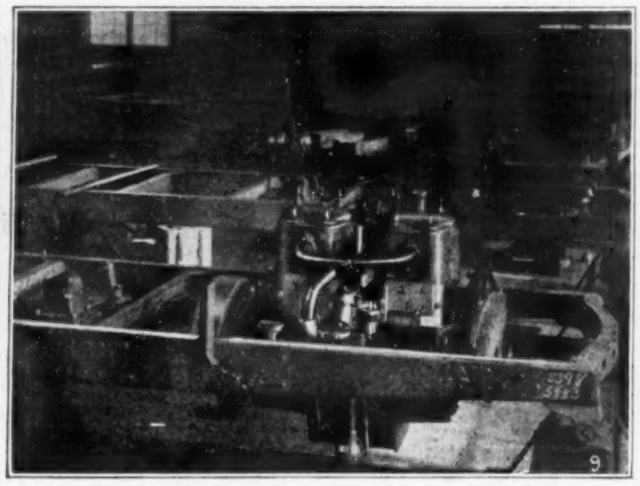


FIG. 9. PUTTING MOTOR AND GEAR BOX IN PLACE

dled on and off the chassis. This also shows the construction of the building, the methods of lighting and ventilating, and the wooden block paving which has been found very satisfactory for the place.

How Do You Prevent Oil From Discoloring Finished Machine Surfaces?

BY HARRY SENIOR

I trust the editors of *American Machinist* will pardon my presumptuous attempt to make light of the apparently serious subject introduced by the above query.

When, on page 886 of Vol. 50, I had the temerity to suggest that elbow grease was the only known preventive for the undesirable discoloration, I perhaps unwarrantedly assumed that prevention and not cure was desired, and that the query related to machines in use and not in storage.

Replies to the original query have been printed on pages 1014, 1080, 1166 and 1176 of Vol. 50, all of which deal with the problem of removal and do not touch the original trouble. Now comes S. A. Inscoe on page 465, Vol. 51, who lifts the problem out of the machine shop and places it in the realm of applied chemistry. He is the first to talk about "prevention," and he admits that the final solution is yet to come—after the chemists get to work.

When the chemists have produced the much-to-be-desired medium of prevention that will prevent, it will be of service only on machines and tools in storage. Bright work on tools in use will still tarnish and discolor from contact with oil, atmosphere, or vapors suspended in atmosphere, and I still contend that the only means of prevention is "elbow grease, vigorously and persistently applied."

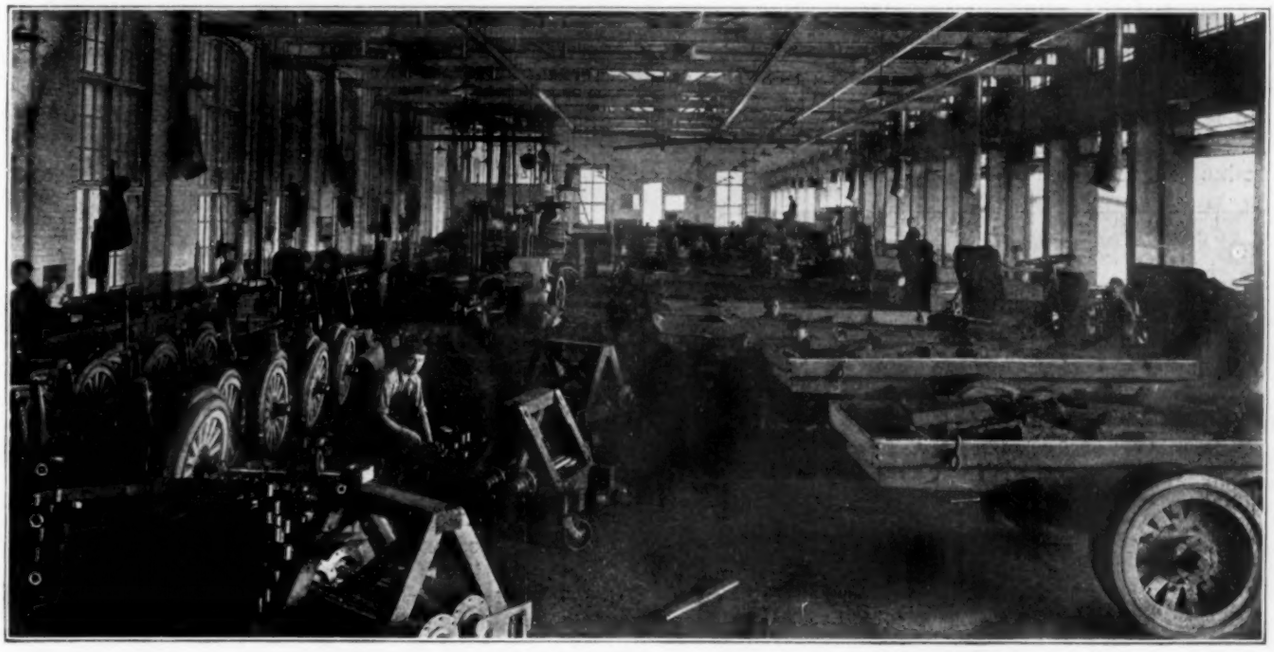


FIG. 10. GENERAL VIEW OF ASSEMBLING SHOP

The machine shop that presents an array of dirty, greasy, discolored machinery creates upon the mind of the observing mechanic an impression of slovenly, slipshod workman and workmanship; and in 99 44/100 per cent. of such cases the impression is correct. On the other hand, clean, bright and orderly machinery suggests careful, conscientious work and the customer who wants a good job well and painstakingly done will make no mistake either from mechanical or financial point of view in submitting it to the latter kind of shop.

So far as the removal of the discoloration is concerned, the method and the effort required depends very much on what the discoloration is. If it is merely discolored oil, kerosene or alcohol will remove it; the latter almost instantly. I supposed all mechanics knew this—I learned it very early in my apprenticeship and have never met a machinist or toolmaker that didn't know it.

If, however, the surface of the metal is discolored (and this was implied in the original query) neither alcohol nor any other application that does not remove the discolored metal will have any effect. There are any number of metal polishes on the market that will enable the operator to remove the skin of discolored metal and disclose new and uncolored metal beneath, but all of them require elbow grease in their application. I am of the opinion that eternal vigilance and a bunch of waste will keep the surfaces clean and bright with far less effort in the aggregate than will be expended by alternate periods of negligence and spasmodic polishing with abrasives ranging from chalk to emery, and that the former treatment will be far less detrimental to the machinery.

Mammoth A. E. F. University in France Lives Four Months

BY GEORGE F. PAUL

The signing of the peace treaty put a sudden end to the activities of the mammoth war university that Uncle Sam had rushed through to completion and had fully equipped at Beaume, on the edge of the war zone in France. The work in different branches of mechanics was especially strong, as there was plenty of American equipment in that section of France that could readily be transferred to the engineering shops.

Machine and hand tools of every description, motors, gasoline engines and locomotives were shipped to Beaume and soon what had been a quiet vineyard was transformed into busy shops. Fig. 1 shows a view of the motor-instruction division of the university. Hundreds of American boys anxiously awaiting the time when peace would be declared were given intensive training that would help them in civilian life. Instruction in airplane mechanics, Fig. 2, proved highly popular because of the many practical tests that were given in connection with the work.

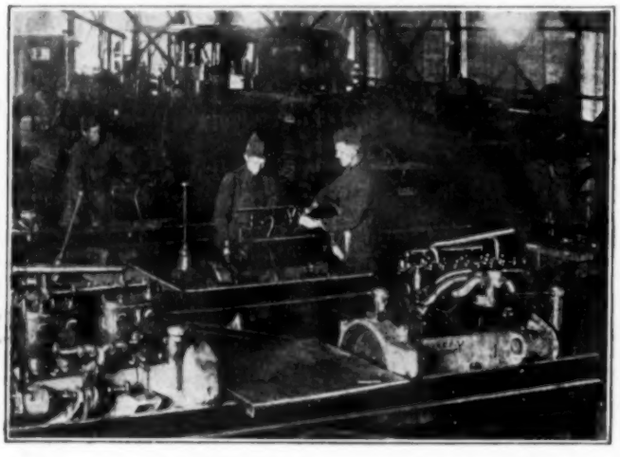


FIG. 1. VIEW OF GASOLINE-ENGINE INSTRUCTION SHOP

FIG. 2. CLASS IN AIRPLANE MECHANICS

With the advent of peace the thousands of khaki-clad students, who had assembled as if by magic, melted away within a few days. Although many of the buildings are of the barrack type of construction, some of the shops and administrative buildings are more permanent and can be utilized by the French, who have always maintained a leading university center at Beaume.

A Shop Motto

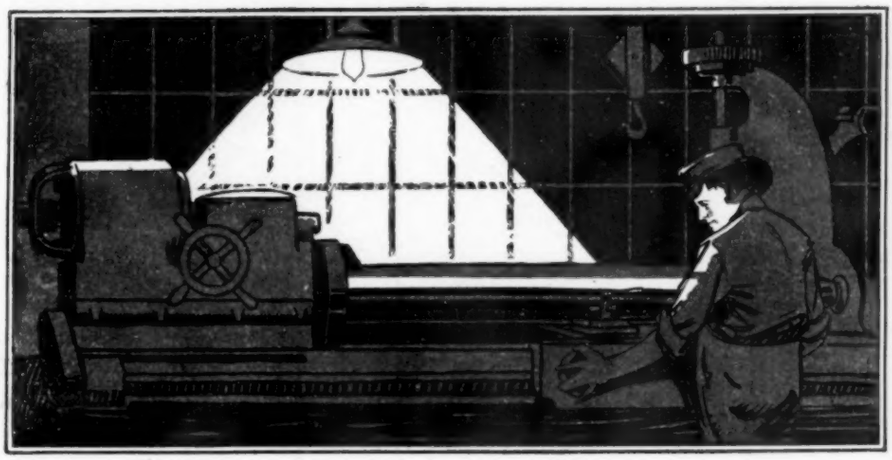
Employers realize more today than ever, that the shop atmosphere influences the conduct of the men working there.

A plant where the machine tools and castings are in a messy condition, the windows (when they are not broken) dirty and a similar condition of the shop in general, cannot be expected to produce the best or highly efficient results.

A SHOP MOTTO

The Hemphill Manufacturing Co., Pawtucket, R. I., believes in keeping things in order. Its shop is kept in a clean and orderly condition, the machine tools are placed with ample room between and the aisles are at all times free from either castings or jigs and fixtures.

With such surroundings the best work from the men may be expected and there is little excuse for mediocre efforts. The illustration shows a motto which is conspicuously displayed in the factory to remind the men that the employers have done the best they could to provide congenial surroundings and in return ask the best returns from the employees.



LIGHT, ELECTRICITY and The Shop

By C. E. Clewell

Developments in Electric Lamps For Shop Use

This article points to some developments of electric lighting for shop purposes and touches briefly the development in shop-window construction from the standpoint of natural-lighting facilities. Reference is made to the use of the new type C tungsten lamp and its increase in efficiency over the older types of tungsten units. Examples of shop lighting by mercury-vapor lamps and by Mazda C lamps are illustrated by night views taken under the artificial light.

IN THE ISSUE of *The Outlook*, May 15, 1918, page 118, an article on "The Nation's Industrial Progress" contains the following significant statement: "Workmen with poor eyesight are a detriment to any business. In order to get the best results, particularly where close measurements and exact work are being turned out, the quality of the light and its distribution cannot be too carefully considered." As a matter of fact numerous issues of the *American Machinist* published six and eight years ago, during the awakening of the industries to the importance of proper lighting, contained statements similar to the foregoing quotation.

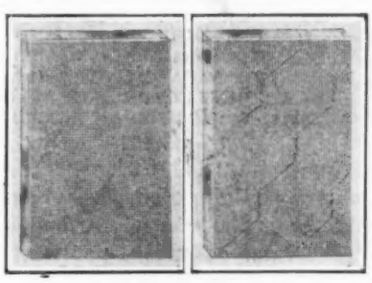


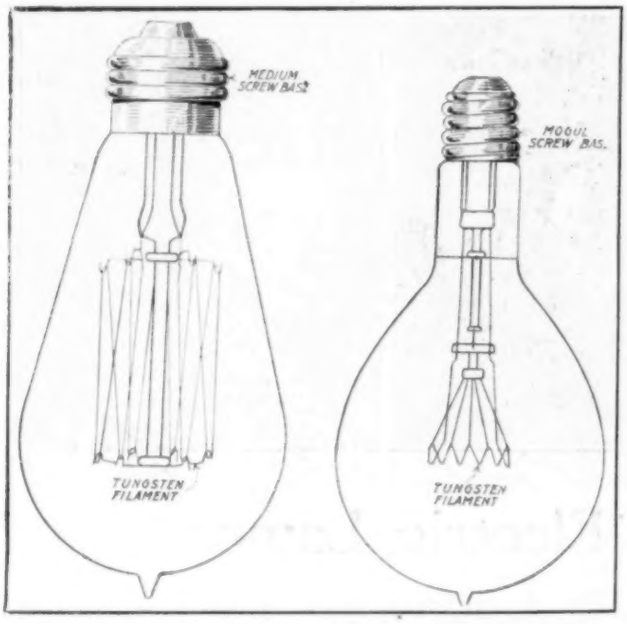
FIG. 1. PLAIN AND WIRE DIFFUSING GLASS

It is desirable in treating of the development of electric lamps to make passing mention of the corresponding advancement in building construction for providing satisfactory natural-lighting conditions. The article previously referred to laid considerable emphasis on the following statement by a leading engineer, who is quoted as saying: "An abundance of daylight is an accepted essential in factories. In fact, any added expense that may be necessary, within reasonable limits, to secure a full measure of natural light will be justified. Well-lighted workrooms unquestionably make for good health, relieve eyestrain, tone up a working corps to insure a better product with less effort, and reduce the hazard of accidents."

Much attention is being given to glass for use in shop windows and sashes, two examples of which are shown in Fig. 1[1]. At (a) a sample of rough-rolled glass is shown, the purpose of which is to increase the uniformity of the distribution of natural light and to diffuse it by the special structure of the glass. At (b) the same type of glass is shown in wire form. The possibilities of adequate natural lighting are illustrated in Fig. 2, which shows a wide shop building with a Pond roof truss (seen to the left in the view). The floor space shows the natural illumination effect to be essentially uniform throughout.

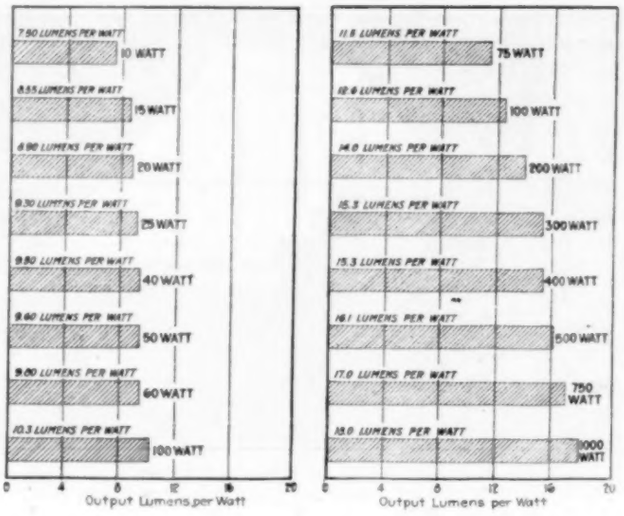
[1]The author is indebted to the following concerns in connection with the illustrations of this article: Fig. 1, Mississippi Wire Glass Co.; Fig. 2, David Lupton's Sons Co.; Figs. 3 and 4, Westinghouse Lamp Co.; Figs. 5 and 6 are based on data in a lecture by G. H. Stickney, I. E. S., U. P. lecture volume; Fig. 7, National X-Ray Reflector Co.; Fig. 8, National Lamp Works of the General Electric Co.; Fig. 9, Cooper-Hewitt Electric Co.; Figs. 10, 11 and 12, the Artificial Daylighting Co., and Fig. 13, the General Electric Co.

FIG. 2. INTERIOR VIEW OF A FOUNDRY (240 FT. WIDE), SHOWING NATURAL-LIGHTING EFFECT WITH SPECIAL ROOF TRUSS



FIGS. 3 AND 4. OLD AND NEW TYPES OF LAMPS

Fig. 3.—Typical Mazda B Tungsten Lamp of the Older Type. Fig. 4.—Typical Mazda C Tungsten Lamp of the Newer Type.



FIGS. 5 AND 6. CHARTS SHOWING QUANTITY OF LIGHT PRODUCED

Fig. 5.—Chart Showing the Quantity of Light Produced per Unit of Energy Consumed by Mazda B Lamps of the General Type Shown in Fig. 3. Fig. 6.—Chart Showing the Quantity of Light Produced per Unit of Energy Consumed by Mazda C Lamps of the General Type Shown in Fig. 4.

In various issues of the *American Machinist* eight or nine years ago descriptions of shop-lighting systems will be found which made use of tungsten lamps as a pioneer advance in the art of industrial illumination. In this early work with the tungsten lamp one of its principal features of advantage over older types lay in the fact that the then new tungsten units could be obtained in sizes between the extremes of the older carbon-filament and arc lamps, thus fitting in with advantage for the successful lighting of a large part of many shop spaces with high ceilings.

In earlier tungsten installations a common approximate figure for the number of watts installed per square foot of floor area was 1.25 with lamps say of the 100-watt size, which produced a quality of light measured in terms of the quantity unit called the lumen equal to somewhere in the neighborhood of 8 or a little more per watt. It is well to note this unit, due to the proposal to rate tungsten lamps in terms of the total lumens the lamp produces rather than as a lamp which consumes so many watts or produces so many candlepower.

The older tungsten lamp, known as the vacuum type, to distinguish it from the more recent tungsten unit filled with gas and known as the Mazda C lamp, is illustrated in Fig. 3 and has been given the trade name Mazda B lamp. A graphic chart has been prepared, Fig. 5, showing the lumens of light produced per watt by Mazda B lamps in the sizes ranging from 10 to 100 watts. For each size of lamp note the rating in terms of the lumens per watt and also that the amount of light produced per watt consumed increases slightly as the size of the lamps increases.

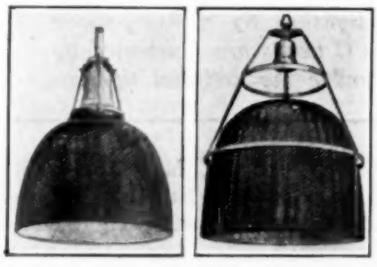


FIG. 7. (a) DIRECT-LIGHTING REFLECTOR FOR 300-, 400- AND 500-WATT MAZDA C LAMPS, (b) SIMILAR REFLECTOR FOR 750- AND 1000-WATT MAZDA C LAMPS

The value of lumens per watt for the 100-watt lamp of the B type is given as 10.3. There has been an improvement of about 25 per cent. in 100-watt tungsten units of the B type in later years, since the amount of light of a 100-watt lamp per watt, as given in Fig. 5, is a little over 10 as compared with about 8 for the older types.

The outstanding development in the tungsten lamp has been the comparatively recent appearance of the so-called Mazda C unit of the general form shown in Fig. 4, with a bulb filled with gas and capable of operating at a higher temperature and of producing a larger quantity of light per unit of energy consumed than its predecessor, the vacuum or B type.

The chart, Fig. 6, shows the quantities of light per watt for the different sizes of the Mazda C units, and as this chart is drawn to the same scale as that for

FIG. 8. AN EXAMPLE OF SHOP LIGHTING BY MAZDA C LAMPS WITH SPECIAL PROTECTION FOR THE BRILLIANT FILAMENT

the B lamps in Fig. 5 the two diagrams are directly comparable. Among the features to be noted in Fig. 6 are the greater range in the sizes of the C lamps as compared with those of the B type, and the increasing quantities of light per watt consumed as the sizes of the lamps increase, the 1000-watt unit producing nearly 60 per cent. more light per watt than the 75-watt size. Comparison may be made of the 25-watt B lamp in Fig. 5 with the 1000-watt unit of Fig. 6, which shows that the latter produces nearly twice as much light as the former for the same energy consumption.

The screw base of the C lamp in Fig. 4 is of the so-called Mogul type, which applies to all units of 300 or more watts in size and in the use of which a special socket is required. Note also the tendency in the Type C lamps to use a filament which is considerably more concentrated in form than that of the B units. This feature contributes to the increased brilliancy of the newer lamps and at the same time demands greater care in the means for protecting the eyes from what may prove to be a very blinding harmful effect.

FIG. 10. AN ARTIFICIAL-DAYLIGHT LAMP FOR COLOR IDENTIFICATION

One of the principal advantages of the tungsten lamp in its earlier uses was that it offered a unit of medium size unusually well adapted to many shop sections for general overhead lighting. A word of caution is therefore in place in arriving at conclusions from Fig. 6 as to the wisdom of employing the very large C units because of their higher light-giving properties per unit of energy consumption. The desire to use a lamp which produces the largest possible quantity of light per pound of coal burned is natural, but it is also important to secure the most favorable effect from the lamps in the illumination of the work. Where this is possible with the very large units, as in some high shop ceilings, the plan to use the very large sizes may be a satisfactory one. For low or moderately low shop ceilings, however, the superiority of medium-sized lamps, because of their ability to produce a more evenly distributed illumination, makes it desirable to give attention to other good points favoring the smaller sizes.

Furthermore many cases occur where the arrangement and the nature of the machinery call for a system approaching local lighting, that is, with lamps fairly close to the work, where the use of very large lamps is not to be considered. In all cases these new lamps ought always to be provided with shades or reflectors for minimizing glare and for increasing the proportion of the total available light sent downward from the lamps to the working surfaces beneath.

The introduction of the Mazda C lamps has imposed several important new conditions on the reflectors

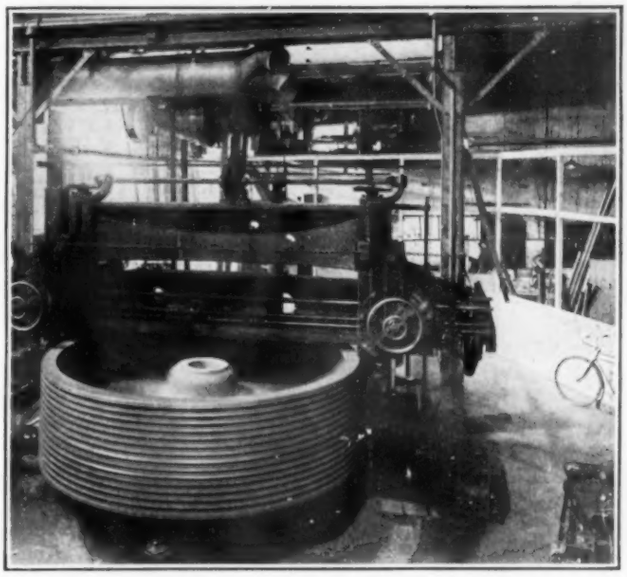


FIG. 9. PART OF A MERCURY-VAPOR LAMP INSTALLATION, SHOWING THE USE OF THE TYPE F LAMP FOR ALTERNATING CURRENT

suitable for use with these units. One of these relates to the different shape of the filament, which should receive proper attention in the reflector design to insure that the distribution of light produced by the reflector and the lamp as a unit is suitable for the conditions of spacing and mounting. Another is the fact that the enormous increase in sizes of the C lamps has called for a new line of large reflectors adapted to the increased dimensions of the large lamps, and designed with adequate provision for ventilation due to the high temperature at which the lamps operate.

Fig. 7 shows two of the larger types of reflectors, (a) being suitable for the 300-, 400- and 500-watt sizes, and (b) for the 750- and 1000-watt units. The weight of such reflectors is about 10 lb. and a special type of holder is employed.

Another unit for industrial lighting is the mercury-vapor lamp, in the development of which during the

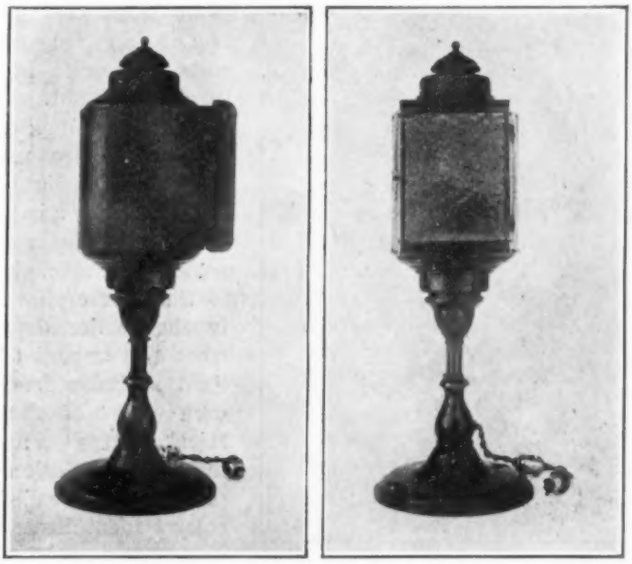


FIG. 11. A PORTABLE COLOR-IDENTIFICATION LAMP, (a) SIDE VIEW, (b) FRONT VIEW

FIG. 12. APPLICATION OF A COLOR-MATCHING LAMP

past 10 years there have been produced new types, so that lamps of this type are available in a variety of sizes and adapted both to direct- and alternating-current circuits.

The excellent illuminating effects that are being accomplished both with the Mazda C and the mercury-vapor lamps are illustrated in Figs. 8 and 9, the former referring to an installation of Mazda lamps with the so-called new "reflecto-cap" reflecting equipment, and the latter to a system of mercury-vapor lamps of the F type for alternating-current circuits. The details of these two shop sections under the artificial light are clearly apparent.

It is evident that the development of new lamps, by which it has been possible to produce given quantities of light at reduced costs, has quite naturally led to a development of appliances designed to produce refinements in lighting results which would not have appealed very strongly to the user of light in the earlier days when the amount of light available from each watt of electrical energy was much less. An example is the so-called color-identification unit shown in Figs. 10 and 11 and an application of which is indicated in Fig. 12. The basis of these units is to employ glass of certain color properties in front of or underneath the Mazda C lamp for the purpose of screening out the necessary components of the natural light of the lamp for producing a resultant quality of light which resembles the spectrum of daylight. The necessity for accuracy in the matching of colors occurs in many plants as a limited although often important item, and this unit, even if somewhat less efficient than the lamp as ordinarily employed, may be a great aid to the work in such special cases.

FIG. 13. A MAZDA C CONCENTRATED FILAMENT LAMP FOR FLOOD-LIGHTING PURPOSES

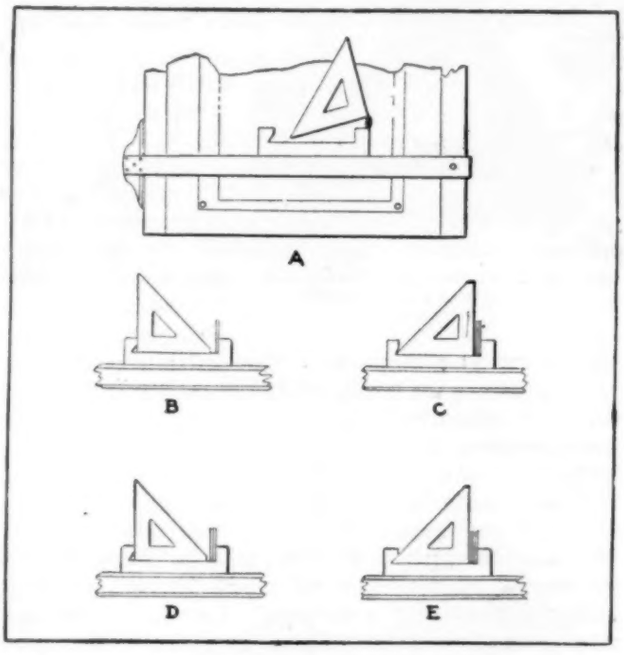
The flood-lighting unit, shown in Fig. 13, has come to hold quite an important place in shop-yard lighting as a protective measure, and is a good illustration of one of the newer uses of the Mazda C lamps.

Section Lining Kinks

BY HOWARD A. HAYDEN

While reading an article on section lining by E. L. Caldwell, page 73 of *American Machinist*, the following improvement suggested itself. Instead of having several sized spacers for different spaces, a single spacer and triangle may be made to serve for four spaces.

File about $\frac{1}{16}$ in. or less off one corner of a 45-deg. triangle and make a $\frac{1}{4}$-in. nick in one corner of the spacer, as shown at *A* in the sketch, making the nick more than 45 deg. Thus, by using the triangle and



SPACER FOR SECTION LINING

spacer as at *B*, the smallest space is made. Turning the triangle around so that its untouched end fits into the nick, the combination for the next largest size is made, as shown at *C*. Now, by placing the triangle so that its filed corner is next to the spacer, it can readily be seen by inspection of *D* and *E* that two larger sizes of spaces can be made by using as before.

If the filings are made bit by bit, the desired spaces can be found in a very short time. With this arrangement there is opportunity for four different sizes of spaces all contained in one spacer, which is very handy and efficient.

American Machine Tools Needed in France

By L. W. ALWYN-SCHMIDT

The demand for American machine tools coming from France is growing. Since the signing of the Armistice the French manufacturers have not lost much time in setting going again the wheels of industry, and the result shows today in fairly considerable orders for American industrial equipment, including machine tools. During the first four months of the present year the value of the American machine tools shipped to France reached $5,000,000.

CONDITIONS seem to point to a continuation of the French demand well into the year 1920, and it is certain that France in the future will be one of the best customers of American machine tools. However, the development of the French market should not be based entirely upon the French demand for machine tools but the American industry should assist its further growth by showing an intelligent understanding of the present problems of industrial France. Our industry should meet the French buyer halfway by offering the kind of machine tools which France is most likely to require during the next few years.

When the German armies began to overrun northeastern France they occupied the most important of the industrial regions, the possession of which the German military command considered sufficiently important to take the risk of breaking Belgian neutrality and drawing England into the war.

For a while it looked as if the blow to the French industry, struck in this manner by Germany, would cripple the industrial life of that country. But France survived the stroke by reason of her wonderful vitality and while her armies were driving back the intruder on the western front her engineers settled down to the business of building up a new iron industry in the East. The work appeared almost hopeless in the beginning. Most of the iron mines of France were in possession of the enemy. France had no coal and a great number of the trained workers of her iron industry were either trapped in the occupied section or had been drafted into the army. Steps were taken to regain as many of the lost workers as possible by releasing from army service all that might be of use for the operation of the machine industry. At the same time new factories were erected in many parts of the country, where there was safety against German attacks from land, water and air. England supplied some of the machinery for these new plants, but the bulk of the machine tools came from the United States. During the four and one-quarter years of the war America shipped machine tools to France to the value of $74,000,000. With the help of these tools and the enormous quantities of manufactured steel and iron France was able to resume the operation of its iron and steel industry at an ever increasing speed until it had reached, during the beginning of 1918, a high-water mark of production which proved of sufficient volume to serve all the purpose of the war and provide for a certain surplus for the demands of the industry of the country.

Many of these new factories were placed discriminately all over France. Good railroad connections, facilities in obtaining labor, and similar causes, determined the selection of the localities. Now with the war at an end a great number of the plants have not only become useless for their original purposes but are placed in such a way as to be of little use for the general peaceful industrial activities. It has been decided, therefore, to dismantle these plants and to sell the equipment or distribute it to manufacturers likely to have use for it. Others of these new factories more favorably located will be sold together with the equipment as going concerns.

It is expected, however, that only part of the machine tools that were employed in government factories engaged in war work will be suitable for use. Many of the machine tools were built for turning out heavy armament, and experience has shown that such tools can only be readjusted with great difficulties to other branches of industrial production. While France has at its disposal, therefore, a great quantity of machine tools costing many hundred millions of dollars the real usefulness of this equipment for the French machinery industry is comparatively small. No estimates have yet been made as to the likely industrial efficiency of the equipment on hand, and it is not certain whether such an estimate will ever be published. Experience of the United States in such matters, however, seems to show that less than half of it will finally enter the permanent industrial equipment of France.

Extent of Destruction Caused by War

In studying the present and future machine-tool needs of France, the following distinct factors have to be taken into consideration: (1) The destruction of industrial equipment in northeastern France; (2) the likely expansion of the French iron industry following the acquisition of the iron mines of Lorraine.

It has now become possible to study the extent of the destruction caused by fighting and also by German vandalism. Inspection has shown a deterioration of the industrial equipment of northeastern France ranging from 100 per cent by destruction to a comparatively unimportant loss of productive efficiency, caused by the extended unemployment of machinery.

Whatever may be the feeling with which we read this statement of facts, we are concerned here only with the results that the German action may have on the future development of this part of the French industry and the consequent demand for machine tools of all description. France can not expect to replace all that has been destroyed by purchases abroad, neither will her industry be served best if Germany should be called upon to replace what her soldiers have destroyed. It is certain that the French industry itself will attempt to repair this destruction with machinery manufactured in French shops. To do this France will require, however, an up-to-date equipment of machine tools, and it is machine tools, therefore, which she is likely to purchase preëminently in our own market. These machine tools will be wanted both in direct replacement of machine tools destroyed or removed by the Germans and for machine shops engaged in the manufacture of other industrial equipment and in the repair of those units which are still fit to be repaired.

The replacement of machine tools removed or destroyed by the Germans falls under the law for the reparation of damages originating from the war which was passed only recently by the French Chamber. By this law two special organizations have been created: the Ministry of Industrial Reconstruction and the Ministry of Liberated Regions. It is the duty of these two ministries to assist in the economic reorganization of the liberated regions of France by making loans to manufacturers and others, by assisting in the purchase of industrial supplies, materials and machinery and in any other manner that may become necessary during the period of reconstruction. These two ministerial bureaus work by means of a subsidiary organization, the "Comptoir General d'Achats Industriels pour les Regions Envahies" which is a centrai purchasing office engaged in buying on behalf of the manufacturers of the invaded territories. This bureau is at the present time the proper agency of communication between the machine-tool maker in the United States and the French manufacturer and machine-shop owner in the formerly occupied territory. The existence of this bureau, however, does not remove for the American manufacturer the necessity to go after his own business in France. If he wants to sell his machine tools to the machine shops under reconstruction in northern France he must introduce his machines as methodically as he would have done five years ago. American machine-tool makers in fact should not regard the present time as an exceptional period in the history of their business with France. While, certainly, it offers unusual opportunities for the introduction of modern American industrial equipment into many French factories it should remain nevertheless only an incident in our commercial connection with France. There is the same need for advertising and for personal representation in any other market outside the United States, and the manufacturer who expects to find the French buyer of machine tools ready to pay any price will find himself very much disappointed.

While the industry in the formerly occupied region of France will find governmental support in reëstablishing itself, this will not be the case with the industrial establishments in other parts of the country. These will have to shift for themselves and their purchasing policy will be directed entirely by the exigencies of the situation and the terms of the offer. Their fate is similar to that of the machine shops located in the territory now taken over by France as the result of the peace treaty, including all Alsace-Lorraine.

Shops in Alsace-Lorraine

The cession of Alsace-Lorraine to France has forced Germany to give up some of her most important machine shops which, together with the very active iron and steel industry of that region, will hereafter be under French domination. The equipment of these shops has been generally pronounced as of the highest class, and many of the American machine tools acquired before the war by Germany have gone into them.

The inclusion of Alsace-Lorraine into France creates a rather interesting industrial problem. While no doubt many machine tools in that part of Europe are of American make there can be no denying that the majority of the equipment is German made and that the arrangement of the factories follows German lines. To keep up the standard of the different machine-tool units in these factories it will become necessary either to finally discard the German equipment or to order renewals from Germany. As the first is not likely, the second will follow inevitably. The Treaty seems to have foreseen such a possibility by making special arrangements for the trade exchange between Alsace-Lorraine and Germany which, even if not expressly desired, nevertheless must give to the German manufacturers a certain predominance in the Alsace-Lorraine market. France no doubt will use this equipment for the purpose of replacing part of the machinery destroyed by the war and to produce also the new equipment necessary for the new French industries. But it is doubtful whether the additional productive capacity coming to France by way of Alsace-Lorraine will be large enough to make France independent of foreign supplies.

Iron and Coal

The most important acquisition of France is the great iron mines of northern Lorraine which together with the coal of the Sarre Valley will be a very powerful industrial asset. France will now possibly aspire to the industrial position formerly held by Germany. Her present industrial equipment, of course, will be entirely insufficient for that purpose and to make the best possible use of her present opportunities it will be necessary for her manufacturers to make extensions in the near future. The capacity of the French machine industry even with the industries of Alsace-Lorraine added will be too small to satisfy the demand. While Germany still may exert some influence on the eastern French machine markets it is not expected that her machine industry will export great numbers of machines owing to her much reduced iron possessions.

France can not pick up the threads of all the work ahead of her industry inside a few years. It cost the German industry more than thirty years to develop its pre-war organization. During the period of development France will be faced by the problem of having to increase permanently her industrial equipment without finding an immediate financial recompense from sales to other countries. The country which will sell to France the industrial equipment for the exploitation of her iron mines, must also furnish the capital for that purpose. This means that America may have to provide the credits necessary to enable France to purchase machine tools and other industrial machinery in this country. This would mean no revolutionary step in international financing. It is a practice which was followed before the war quite regularly by England and to a lesser extent by Germany. We ourselves adopted it with good results during the war, when large credits were extended to the allied powers to enable them to make their purchases in the United States.

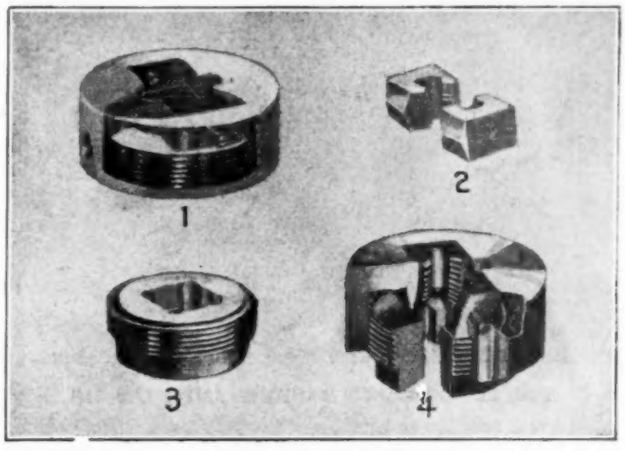
The financial handling of such transactions most likely will not affect our machine-tool makers. It will be an arrangement between the banks in this country and in France. It is, however, necessary that our machine-tool makers should understand the necessity of such an arrangement in order to give it their support on the boards of banks, in commercial associations and whenever an opportunity is found. Giving financial credits in support of a merchandising campaign is still something new to our banks, and they need at the present moment the moral support of those most interested in the extension of this practice to justify their policy before their shareholders and the governmental supervisors.

The Manufacture of Caps for Threading Dies

By F. E. MERRIAM

In considering the manufacture of screw-cutting dies we are prone to think in terms of accurate threads, clearances, and cutting angles as being the all important factors. In the case of dies made in two or more parts, they must have some provision for adjusting, aligning and clamping the parts so that the cutting size can be controlled and proper alignment assured. An important part of such a holding device is known as the cap and much of the efficiency of the die depends upon the correct machining of this part.

THE two-part dies made by the Greenfield Tap and Die Corp., Greenfield, Mass., are held in collets composed of two parts, the guide and the cap, the whole arrangement being shown in Figs. 1, 2, 3 and 4. The cap controls alignment and adjustment, while the guide provides the means of clamping. The importance of the cap in the performance of its duty of alignment cannot be over emphasized, for the alignment of the dies must be very correct or cross-threading will occur. This means, of course, that all manufacturing operations must be very carefully performed. The



FIGS. 1 TO 4. COMPONENT PARTS OF A TWO-PIECE DIE
Fig. 1—The Cap. Fig. 2—The die. Fig. 3—The guide. Fig. 4—The assembled parts

caps range from $1\frac{1}{4}$ to $4\frac{1}{2}$ in. in diameter, providing for dies cutting from $\frac{1}{16}$ to $1\frac{1}{2}$-inches.

The initial manufacturing operation consists of reaming, facing surface *B*, Fig. 5, and tapping for the guide, thus furnishing a surface from which the piece can be readily held for subsequent operations. The succeeding operations follow in a logical manner, providing convenient locating and holding surfaces for each successive operation, thus simplifying tooling and machining.

The design of the cap is such as to render tapping somewhat difficult, since the casting has four grooves *A*, which tend to rapidly dull the cutting edges of the tap. These are also the cause of occasional breakage. The grooves are necessary for casting purposes, unless a type of core is used which would increase the per pound cost of material more than it is believed could be saved in machining. It has been found that taps and reamers with an even number of flutes catch in the four grooves and break; consequently, tools with five blades were used and gave excellent results.

The caps are of malleable iron, usually furnished by one foundry only, and show excellent uniformity as to hardness. A common cutting compound has proved satisfactory as a coolant.

The taps and reamers for this job, Fig. 6, have the chasers and blades held firmly in place by wedges curved to fit the grooves in them and in the bodies, as shown, and are located in the direction of their length by the

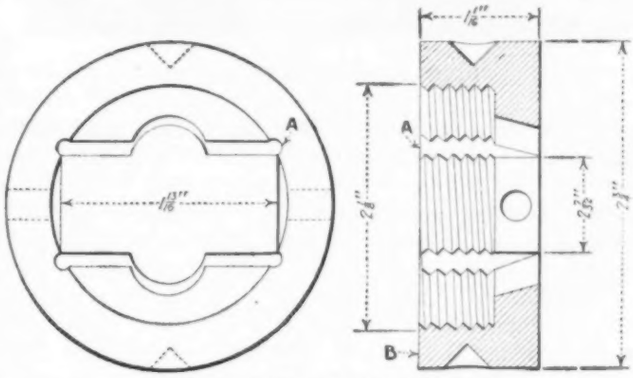


FIG. 5. DETAILS OF THE CAP

ring *A* which is threaded to the shank of the tap. With this arrangement, when the chamfers at the ends of the blades break or dull they can be reground and readjusted by the ring *A*, after loosening the wedges. While not difficult to back out, the wedges hold the blades very firmly in place and provide what is to all intents and purposes a solid tap. By means of this adjustment, it is possible to use up nearly all the material in the blades, very little wastage occurring. The center, or body, being of soft steel saves a considerable material cost and eliminates the many hardening difficulties encountered in the manufacture of solid taps

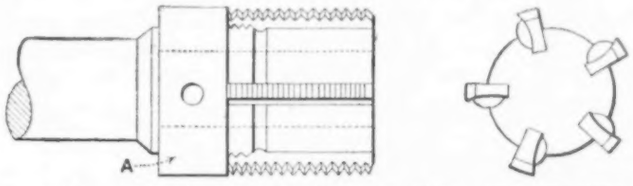


FIG. 6. CONSTRUCTION OF THE TAP AND REAMER

and reamers. Another advantage of such taps is that when worn, they can be brought to size again by placing thin strips of metal beneath the blades.

The facing tool requires but little explanation and while rather expensive to make is very satisfactory.

The machines used for this operation, Fig. 7, are large turret lathes so belted and geared as to furnish a powerful drive at high speed. Hand feed is used and one handle of the turret feed device is arranged so as to allow it to be operated by the foot and so provide a still heavier feed. Each operator grinds and sets his own tools. A large box of raw material on an elevating-truck platform stands at the operator's left and an empty box for finished material on his right.

Air chucks are used for holding the caps and have increased the output of the machines fully 20 per cent. as compared with the lever-operated chucks previously

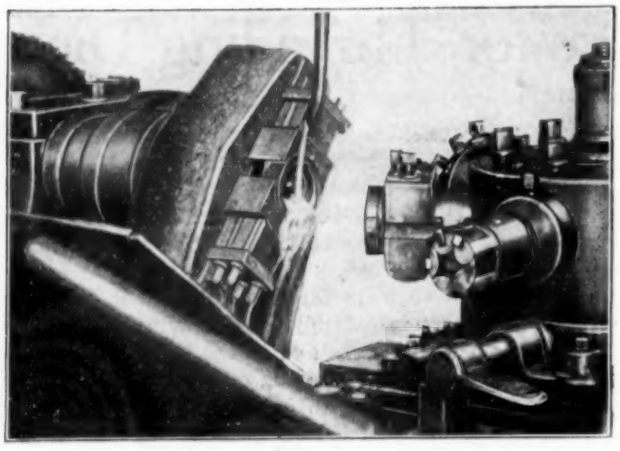


FIG. 7. REAMING AND FACING

used. A lug is provided on each cap which fits a notch in the chuck and so furnishes a positive and unfailing drive.

The threaded portion of the cap provides a convenient and reliable method of setting up the work in the machine for the turning and facing operation. A threaded arbor is inserted in the spindle of the machine and the cap screwed on against a shoulder. A simple wrench, fitting the slot, easily and quickly removes the caps when finished. The manner of holding the cap during this operation is important, aside from its convenience, because it makes certain the turned surface will be in alignment with the threaded part and because in the third operation the slot is located from the turned surface. This plan of locating the work brings the slot in line with the guide when assembled with the cap which is necessary for the proper functioning of the die.

Fig. 8 shows the turning and facing operation. The machine is a combination turning and facing machine especially built for this work. The movements of the cutting tools are synchronized so both cuts are completed at the same time; thus eliminating a common source of loss. A belt on the feed shaft furnishes ample power when the tools are in good order but also furnishes unmistakable evidence whenever the tools become so worn as to be inefficient. It also acts as a

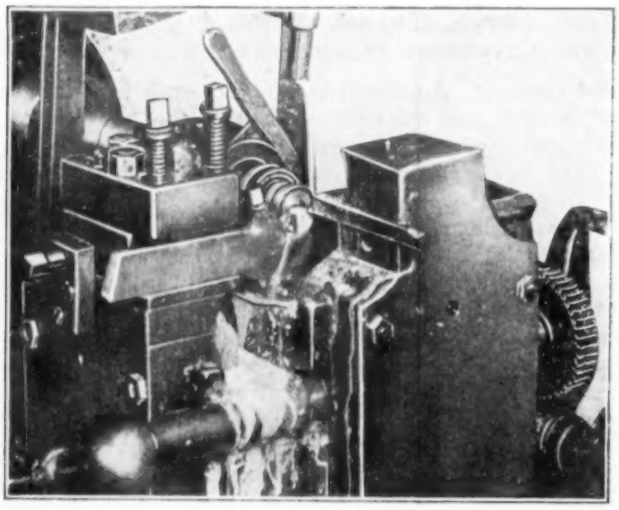


FIG. 8. TURNING AND FACING

safety valve and prevents the breakage of any part due to an overload.

These machines are arranged in batteries of three with one operator per battery. Several matters incidental to succeeding operations limit the rate of production of this operation and on this account the feed and speed is less than would otherwise be the case. Years ago the principal deterrent was the polishing operation which could not be economically performed unless a fine feed was used, since the finishing was a purely polishing operation and did not therefore remove much metal. Now, however, a grinding operation follows which permits coarser feeds and secures greater economy and speed.

Truckers bring the rough material to the machines in small trucks which are conveniently located on the operator's left where the material is readily available for use. The finished work is arranged on a shelf above the machine at the operator's left which will hold any ordinary day's work. This makes the counting of the output an easy matter.

The malleable castings are made with about $\frac{1}{16}$ in. of metal to be removed in this operation and, except

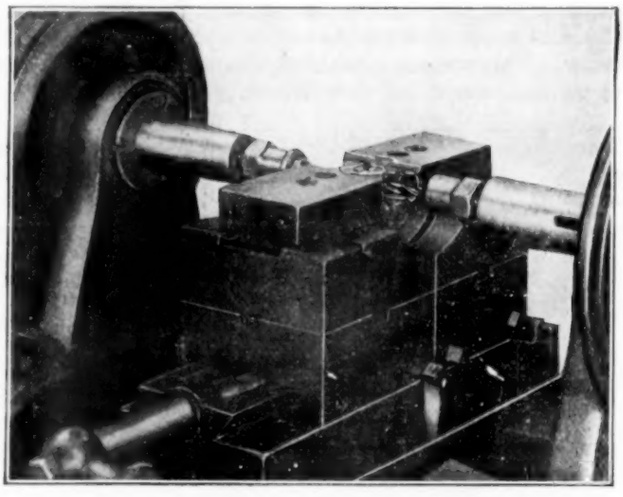


FIG. 11. DRILLING MACHINE AND FIXTURE

in the case of the largest size caps, the slots are machined in Boynton & Plummer traverse shaping machines of which several are in use.

A fixture for slotting the caps is shown on the machine in Fig. 9. The cap is set in the fixture with the top toward the machine and a circular clamping device holds it firmly by the outside, compressing the holder sufficiently to grip the cap. The holder is inclined at a proper angle to bring one edge of the slot horizontal and parallel with the movement of the machine head. The fixture is pivoted, or hinged, as shown in Fig. 10, which permits it to be turned away from the machine for readily setting up the cap and removing it when completed. One side of the slot completed, the sleeve, in which the cap is carried, is rotated bringing the opposite edge of the slot into position. Suitably arranged screws permit adjusting the fixture to bring the slot into the correct position and once set, no further attention is required.

The drilling and spotting operations are very similar and may well be described together, since they differ only in the cutting tool used. The drilling provides tap holes for the die-adjusting screws while the spotting

furnishes the means of holding the caps in the stocks.

The drilling machine, Fig. 11, has two spindles, between which the fixture for holding the work is set. Each spindle is belt driven from a countershaft, and cone pulleys provide the speeds necessary to compensate for the difference in size of the drill and countersink and variation in hardness of the material. The feed is by a foot lever which moves the spindles simultaneously while springs furnish a quick return when the cut is completed.

Two forms of jigs are used, one being a clamping device similar in style to a vise while the other consists of a plate bored to fit the cap. This latter holds the work in position and does away with any clamping. The bored plate style, however, possesses several advantages over the other, the chief of these being that the clamping is eliminated and it is possible to provide a bushing guide for the drill close up to the work. This greatly decreases the liability of drill breakage. Chip room and chip removal is not, however, so easily accomplished with this style of fixture; but still this is not difficult to arrange.

The actual machining time per cap is so small in each of these operations that much depends upon the speed and dexterity of the operator who must be able to handle the caps very rapidly and accurately. Considerable skill is, of course, necessary to set the cap for drilling in the proper location, for no device is provided to bring the slot and the holes into proper relation with one another. The operators after a very short time perform this very satisfactorily by eye alone.

After drilling and spotting, there is a slight filing operation which removes the burrs and squares up the ends of the slot, leaving it in condition to receive the die and present a neat, finished appearance.

Tapping for the adjusting screws comes next, and is very rapidly performed with a small bench tapping machine.

Following the tapping operation, the adjusting screws are inserted with a power screwdriver. The equipment is very simple, consisting of a spindle carrying the screwdriver and an inclosing sleeve to keep it from slipping out of the screw slot.

The polishing operation follows and consists of roughing and finishing operations. The top of the caps, that is, the portion containing the slot must receive the greater attention, since the stamping is placed here and it is the only part exposed when in the stock.

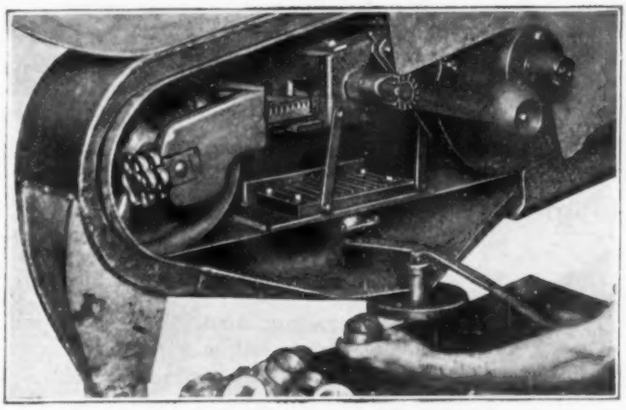


FIG. 12. ROUGH-POLISHING

The rough-polishing of the top and underside is carried out on a Bleveney belt grinding machine and the final operation is accomplished on an ordinary polishing head. The belt machine, Fig. 12, is set up so that the operating portion of the belt runs nearly horizontal and at such a height that the workman can handle the work conveniently while seated. The work-holding fixture consists of a plate of suitable size with four narrow strips attached forming a square in which the cap can be placed, the strips holding it in place during the operation. A lever is attached to the plate and pivoted to a standard on the machine in such a manner as to allow considerable movement of the lever and plate in all directions. The cap is placed in this pocket and is held, by means of the lever, against the polishing belt as long as may be necessary to secure the desired degree of finish. Usually a quick pass under the belt is sufficient. This machine has resulted in a very considerable saving because it is no longer necessary to use as fine a feed during the turning operations and because it considerably reduces time required for the final finishing.

During final finishing the cap is carried on a threaded arbor on the spindle of a polishing head and the

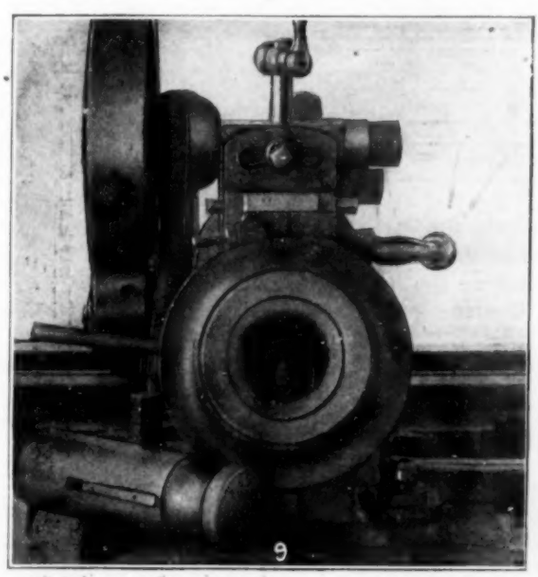


FIG. 9. SHAPING MACHINE AND FIXTURE FOR SLOTTING

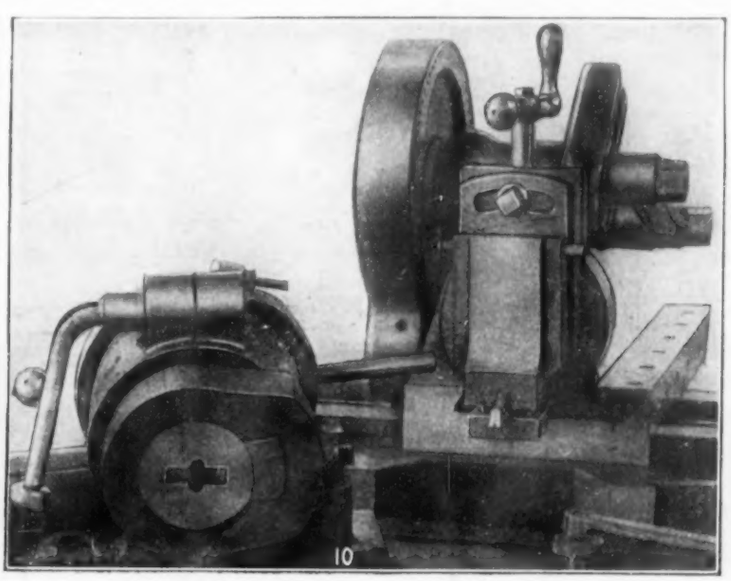


FIG. 10. SLOTTING FIXTURE READY TO BE LOADED OR UNLOADED

polishing accomplished by abrasive cloth used in the customary manner.

When polished the caps are oiled to prevent rusting, and sent to a stock room until assembled with the dies and guides.

Gaging Acme Threads Without Special Wires

BY H. A. PEARSON

The tables for use in gaging Acme threads as published in most handbooks are based on wires which come flush with the tops of the threads on Acme taps and 0.010 in. above the tops of the threads on the screws. As many shops do not keep these special wires on hand the following equations have been derived. They can be applied to any wire which may be available.

A cross-section of a standard Acme thread is shown in the figure. The angles are marked and the gaging wires are shown in position. The clearance between nut and screw is 0.020 in., the screw being made standard and the nut 0.020 in. oversize. If we let D represent the diameter of the wire and W the width of opening at the top of the flat, then

$$BC = AB \cos 14°30'; \quad (1)$$

$$AC = GH = AB \sin 14°30'; \quad (2)$$

$$FH = AH \operatorname{cotan} 14°30'; \quad (3)$$

$$AB = \frac{D}{2}; \quad (4)$$

$BE = FG$ or the distance from the center line of the wire to the outside of the screw.

We wish to derive an equation for EB in terms of the known quantities D and W. From the figure,

$$BE = FH - AC \quad (5)$$

$$AH = \frac{W}{2} - BC \quad (6)$$

Substituting (1) in (6) gives us

$$AH = \frac{W}{2} - AB \cos 14°30'$$

$$= \frac{W}{2} - \frac{D}{2} \cos 14°30' \quad (7)$$

Substituting (7) in (3) gives

$$FH = \left(\frac{W}{2} - \frac{D}{2} \cos 14°30'\right) \operatorname{cotan} 14°30' \quad (8)$$

Combining (2), (4), (5) and (8) gives

$$BE = \left(\frac{W}{2} - \frac{D}{2} \cos 14°30'\right) \operatorname{cotan} 14°30' - \frac{D}{2} \sin 14°30' \quad (9)$$

The micrometer reading over the wires will then be equivalent to

$$2(AB - BE) + \text{O.D. of screw} \quad (10)$$

or

$$2\left(\frac{D}{2} - \left[\left(\frac{W}{2} - \frac{D}{2} \cos 14°30'\right) \operatorname{cotan} 14°30' - \frac{D}{2} \sin 14°30'\right]\right) + \text{O.D. of screw} \quad (11)$$

If we obtain the values of the functions of the angle 14°30′ from tables and substitute in (11), the micrometer reading reduces to

$$4.9937\,D - 3.8667\,W + \text{O. D. of screw} \quad (12)$$

Construction of a simple table will facilitate the use of this equation in the shop. The width of the flat at the top of the thread a is equal to 0.3707 in. multiplied by the pitch and consequently,

$$W = \text{pitch} - 0.3707 \times \text{pitch}$$

From this equation we get Table I.

The equation can now be used by making one multiplication and one subtraction. For example, suppose we want to gage a 1-in. O. D., 6 threads per inch standard Acme thread using two sets of wires, the larger having

TABLE I. VALUES OF W AND 3.8667 W FOR SCREW

No. of Threads per Inch	W	0.8667W
4	0.157325	0.6083
5	0.12586	0.4866
6	0.1048	0.4052
7	0.0899	0.3441
8	0.07866	0.3041

a diameter of 0.09085 in. and the smaller of 0.08319 in. The readings will then be

4.9937 × 0.09085 in. − 0.4052 in. + 1.000 in. = 1.0484 in. and

4.9937 × 0.08319 in. − 0.4052 in. + 1.000 in. = 1.0102 in.

To get the readings when the wires are used for measuring the tap we make use of the same general equation,

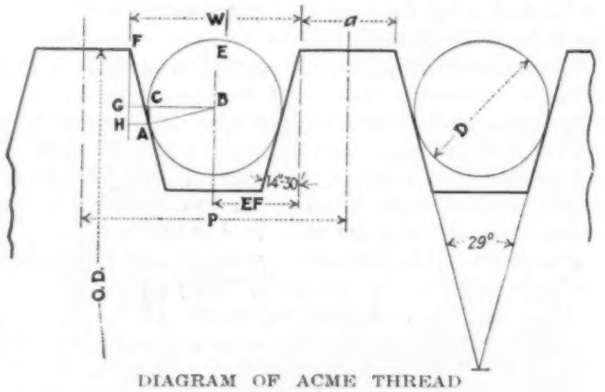


DIAGRAM OF ACME THREAD

noting that W and O. D. of screw have different values in order to give the necessary clearance between screw and nut. As the O. D. of the tap is 0.020 in. larger than that of the screw, the width a of the top of the flat is 0.3707 × pitch − 0.0052 and

$$W = \text{pitch} - 0.3703 \times \text{pitch} + 0.0052 \quad (14)$$

From this expression we can calculate the values given in Table II.

If we work out the same problem as before, substituting the tap for the screw, we should get the same

TABLE II. VALUES OF W AND 3.8667 W FOR TAP

No. of Threads per Inch	W	3.8667W
4	0.16252	0.6283
5	0.13106	0.5066
6	0.1101	0.4252
7	0.0951	0.3676
8	0.0839	0.3241

readings over the wires as before by reason of the construction of the Acme thread.

Substituting the new values, we have

For small wire—4.9937 × 0.08319 − 0.4252 + 1.020 = 1.0102 in.

For large wire—4.9937 × 0.09085 − 0.4252 + 1.020 = 1.0484 in.

These values check with the others.

Erratum

A typographical error appears on page 692 in the article by Capt. H. M. Brayton on "Charts for the Proper Cutting Speed of Steel." In the numerator of the fraction in formula 3 a decimal point has been omitted. The numerator should be 19.5 and not 195 as printed.

Donaldson & Fisher Gear-Generating Machine

By J. V. HUNTER
Western Editor, *American Machinist*

The demand for economical gear-cutting machines has put designers on their mettle and has led to the development of several such machines that have lately been put upon the market. In the following article there is described and illustrated a gear-generating machine that is the work of a designer having an established reputation.

THE gear-generating machine shown in the accompanying illustrations is being built and marketed by the Donaldson & Fisher Manufacturing Co., Chicago, Ill. The machine, which is very compact, will cut straight and helical gears, worms, wormwheels and will spline shafts.

The bed is heavy in construction and has a three-point bearing at the bottom, the lower part being used as a reservoir for the coolant. The upright carrying the saddle and cutter head is low and massive and is firmly bolted to the bed.

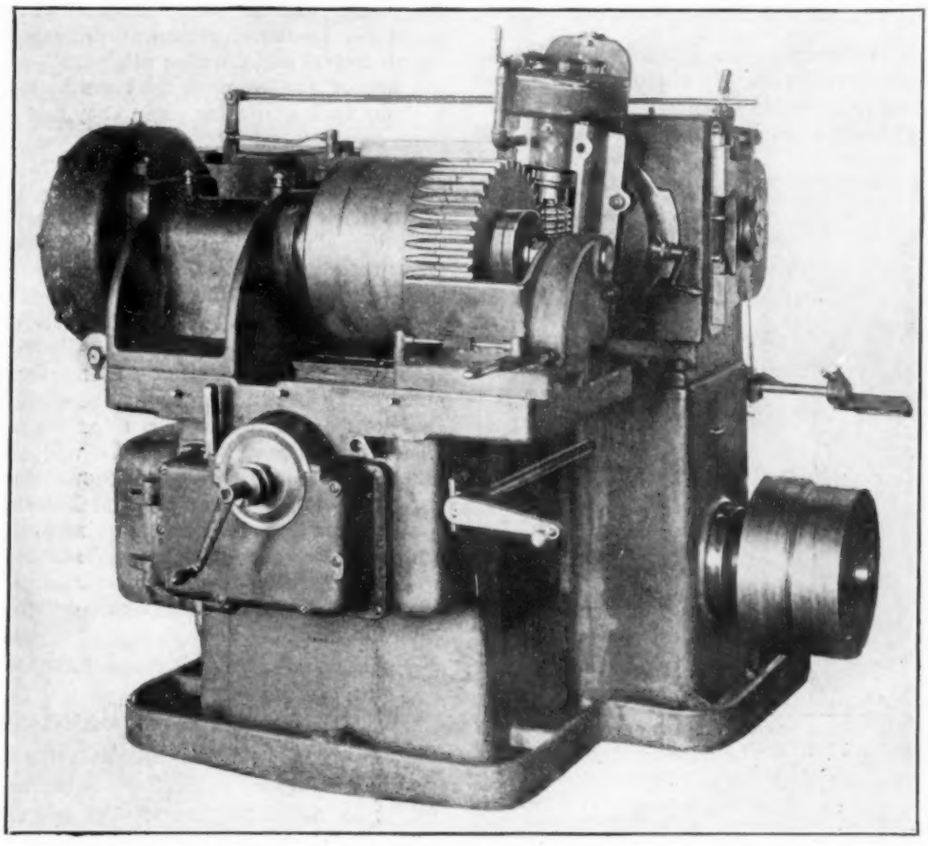


FIG. 1. DONALDSON & FISHER GEAR-GENERATING MACHINE (FRONT)

As may be seen in Fig. 1, the headstock and tailstock are mounted on a heavy table in which provision is made, by a cross-slide, for moving them to or from the hob as may be required for work of various diameters and for adjusting the depth of cut. The crossfeed has a large micrometer dial reading to 0.005 in. Adjustable stops are provided so that the same work settings can be repeated without reference to the dial. When set, the table can be securely locked in position.

The saddle is wide and has a generous bearing on the rail, provision being made for taking up all wear by means of taper gibs. The saddle is fed to the work by a feed screw working in tension and its movement is controlled by gearing inclosed in the feed box shown open in Fig. 2. In addition the feed box contains the mechanism for the return movement of the saddle and the feed trip.

The speed box and index-gear case, Fig. 3, is a self-contained unit and is covered by double doors making it readily accessible for changing the gears. The swivel head is accurately graduated and by means of a vernier angles of inclination can be read to 3 min. of arc.

The hob spindle has a taper hole and is provided with a draw-in rod. Provision is made for adjusting it endwise to within 0.005 in. and when set it is securely held by clamp bolts. The work spindle is large and runs in bronze bearings adjustable for wear, the rear bearing having an endwise adjustment to take up end wear, this latter being accessible through the case covering the index wormwheel.

The tailstock is rigidly constructed and is provided with a quick-locking device enabling it to be readily attached to or removed from the table.

A pump draws the coolant from the reservoir forcing it out through holes in the hob-spindle bearings. The stream strikes the hob endwise from above, washing the chips down into a basin where they are held by a suitable strainer while the coolant drains into the reservoir.

Adjustable automatic stops are provided so that on completion of the work it is withdrawn from the hob

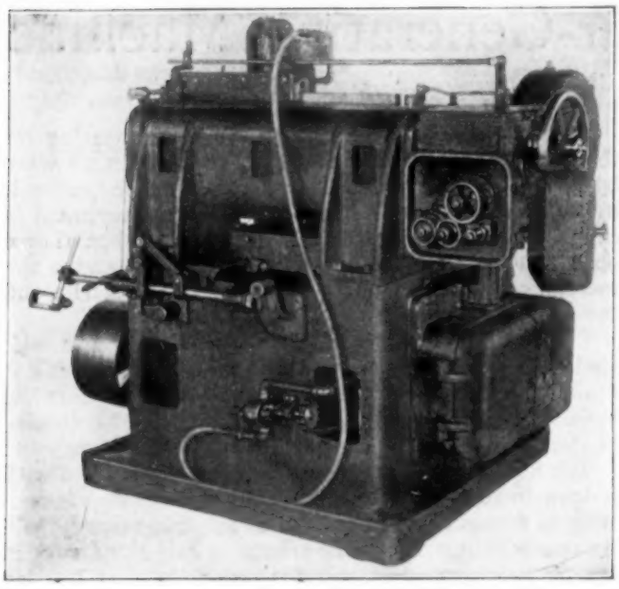


FIG. 2. DONALDSON & FISHER GEAR-GENERATING MACHINE (BACK)

and the saddle is returned to its starting position at which time the belt is automatically shifted to the loose pulley, bringing all movements to rest.

The machine illustrated is known as No. 4, but the

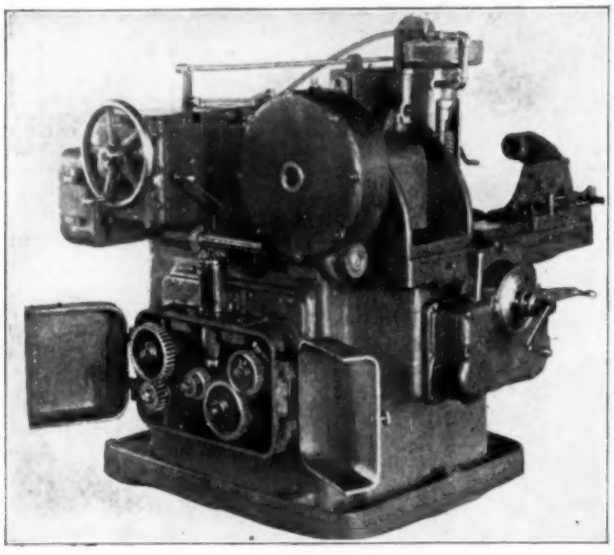


FIG. 3. DONALDSON & FISHER GEAR-GENERATING MACHINE (END)

Specifications: Capacity, gears 14 in. in diameter by 14 in. wide (or wider if so ordered); will cut cast-iron gears up to three diametral pitch; steel gears up to four diametral pitch; pulley, 14 x 3½ in.; speed, 350 r.p.m.; floor space, 54 x 67 in. ; weight, 5500 pounds.

maker is engaged on the designs of other sizes. If wanted for cutting wormwheels the feed box will be replaced by a special one for that purpose.

Comment on Spur-Gear Diagrams

By George W. Childs
Works Engineer, American Steel Foundries

Referring to the article entitled "Spur-Gear Diagrams," by G. C. Sundberg, published on page 568 of the *American Machinist*, the writer begs leave to submit the following:

There is nothing new in the article. I dare say every machinist, patternmaker and draftsman who has worked on gears is familiar with everything contained in the diagrams and had it drilled into him at the beginning of his apprenticeship.

Men in the above professions know how to compute easily and quickly in their heads the diametral pitch, circular pitch, pitch diameter and outside diameter of gears, and if they do not, the effort will do them good and prove beneficial to their gray matter. I had to know all the above and a great deal more long before I was 16 years of age, or take the chance of a good cussing from the old man.

I am sure that every man in the trades mentioned is perfectly familiar with the little blue catalog of machinery and tools that Brown & Sharpe, of Providence, R. I., has had on the market for many years and which I believe they will send to anyone for the asking. The catalog contains not only all the information shown on the diagrams, under discussion, but a great deal more. I would recommend that anyone interested in the lines mentioned and not having this useful little catalog in their possession, write and secure one.

Brown & Sharpe also publishes and has for sale a book on "Gearing," which draftsmen, patternmakers and machinists should have, and in which book, several pages will be found giving all dimensions of gear teeth for diametral and circular pitches.

I am of the opinion that mechanics are better off without such diagrams when they can work them out in their heads.

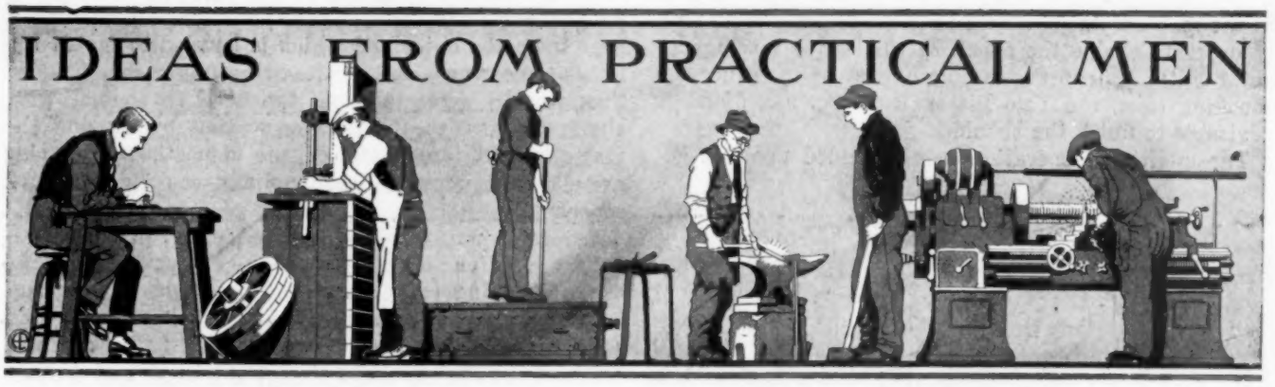
With reference to the last paragraph, when I was a boy I made a very elaborate and, as I thought, a very pretty little card showing decimal equivalents of fractions of an inch and presented it to one of the leading men in the machine shop. I, of course, thought he would thank me, etc., but instead he tore it in halves before my eyes and gave me a little fatherly advice as follows: "Don't waste your time with such rot; memorize the table and then you will be doing something." I did, and I carry in my head today the decimal equivalents of fractions of an inch which I can repeat at a moment's notice by 64ths or 32nds. We will assume that every man in the lines mentioned knows the decimal equivalents for eighths, quarters and halves. If he does, he can easily memorize next the sixteenths, thirty-seconds and then the sixty-fourths. With a little practice he will in time be able to carry them all in his head and the effort will do him no harm—on the contrary, it will repay him many times.

Utilizing Broken Band-Saw Blades

By Henry Mitchler

When band-saw blades for sawing metal become broken, it is the usual practice to discard them entirely. These saws cost a great deal of money and in some instances are in use a very short time, thus necessitating the purchasing of new ones, the old ones being thrown aside. A great deal of expense is thus incurred annually.

Upon the suggestion of our superintendent, these old and apparently useless band saws have been cut up and remade by punch and die work into hacksaw blades which were substituted for purchased blades, which cost 12 cents each. From one of the discarded band saws, 25 to 30 hacksaw blades can be made and in that way the purchase of new ones avoided. It takes a man approximately two days to make a punch and die and one boy one day to punch out about 2200 of them.



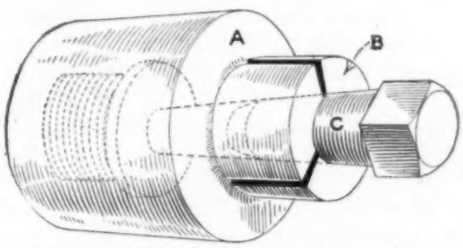
A Simple Expanding Mandrel

By E. A. Dixie

The illustration shows one of the simplest and most effective expanding mandrels for holding and driving work in the lathe or milling machine.

The body *A* is made of either machine or tool steel and can be either left soft or hardened, depending on the amount of wear expected of it. If hardened there should of course be enough metal left on the work seat *B* to permit grinding in place in the machine.

The tapered hole for the plug *C* is reamed with any of the standard tapered reamers, Morse, Brown and



SIMPLE, POSITIVE EXPANDING MANDREL

Sharpe or Jarno. If the female part is hardened for accurate work it should be ground in the taper, but if used for roughing only it can be lapped out quite good enough with a piece of wood and emery cloth.

In any case the tapered plug *C* should be hardened and tempered. It can be made with a large square head as shown or with a thread and nut for withdrawing it from the hole. As a matter of fact a twist with a wrench on the large square head will release the tapered plug from the hole much quicker than it can be withdrawn with the nut.

Floating mandrels like this are used by a number of gear manufacturers. The writer has seen this type of mandrel 1½ in. in diameter driving steel spur gear blanks 8 in. in diameter under a heavy cut.

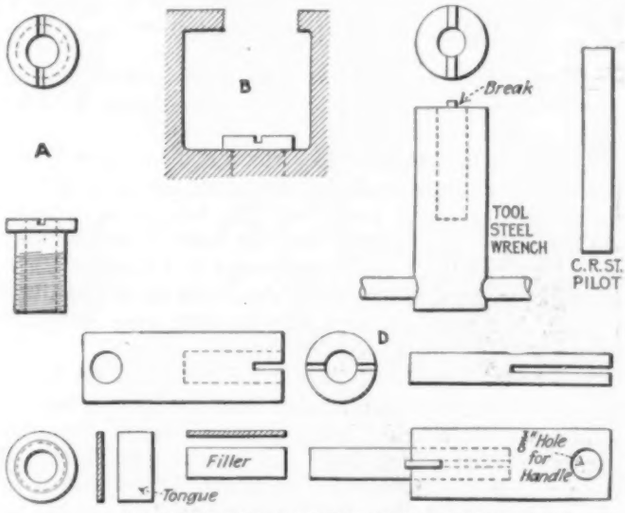
If carefully made and used for finishing cuts only, this mandrel will run and continue to run as true as any mandrel known to the writer.

Special Wrench for Removing a Bushing

By H. H. Parker

When overhauling a certain make of airplane carburetor, it was frequently necessary to remove a brass bushing, shown at *A* in the sketch, which was screwed into the aluminum body casting. The bushing was located within the body as at *B* and for that reason was rather inaccessible. A 1-16-in. square slot was provided in the head of the bushing to facilitate its removal, but as the threads held very tightly and no special wrenches were provided, we encountered great difficulty in taking it out.

A large screwdriver was tried but it bent and damaged the slot. Then a tool-steel wrench was made as at *C* with a couple of projections milled on the end, and a cold-rolled steel pilot rod inserted after the body was hardened and tempered. This wrench soon broke at the point shown and after several had failed in this way



WRENCH FOR REMOVING BUSHING

another was made as shown at *D*. The body was of cold-rolled steel, left soft, drilled for a pilot bar and provided with a 1-16-in. slot, ⅜ in. deep; the pilot also being slotted.

A tool-steel tongue was made 1-16 x 7-16 x ⅞ in., hardened and tempered, and several extra ones were made at the same time. The parts were assembled as shown, driving fits being used throughout and a soft-steel filling piece inserted in the pilot slot after the tongue was in place but before driving the pilot into the wrench body.

This type of wrench gave perfectly satisfactory results; there was little tendency for the tongue to bend or break, but in case this happened the damaged one could be easily driven out and a new one inserted, without scrapping the whole wrench.

Chuck for Holding Pot Castings Used in Making Piston Rings

By John Drew

The cylindrical iron castings—"pot castings" as they are called—used in the manufacture of rings for the pistons of gas and other engines, are cast with a beveled shoulder at one end to facilitate chucking them

in the machine that reduces them to piston rings; and, in order to enable the chuck of this latter machine to get a better grip on the casting as well as to reduce the chucking time, the Yale Piston Ring Co. has found it advisable to finish the shoulder.

The additional operation being decided upon, it became necessary to devise a means of performing it within the amount of time that would be saved, in order to justify the extra work.

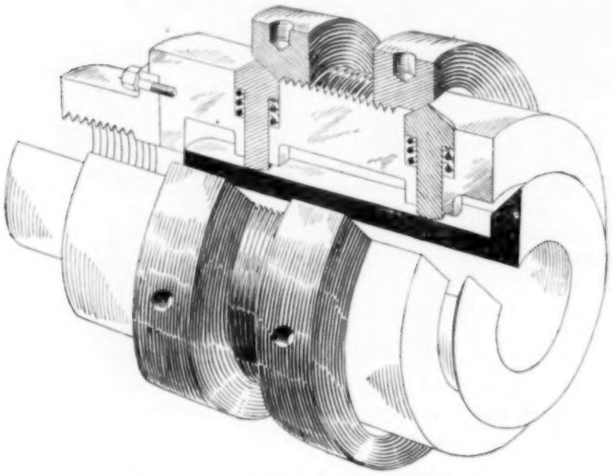


FIG. 1. DETAILS OF THE CHUCK

Anybody that has tried to "true up" a cast-iron bushing 6 in. in diameter and a foot long in an ordinary three- or four-jawed chuck and then attempted to work on the outer end of the bushing with a single-point tool does not need to be told that it is not a time-saving operation. The special chuck shown in the illustration, however, accomplishes it with ease and certainty.

The body, Fig. 1, of this is hollow, the bore being quite a little larger in diameter than the largest casting it is designed to hold. Midway of its length, the outer surface of the chuck body has a coarse-pitch thread upon which are fitted the two rings. The thread in the rings extends but half way through and the remainder of the bore is plain and is tapered about 15 degrees.

Two sets of pins, each set spaced 120 deg. apart, pass through the body of the chuck. The pins have a head upon the outer end which is beveled to match the bore of the rings, and a coil spring under the shoulder thus formed serves to hold the head in contact with the inner surface of the ring so that by turning the rings toward the middle of the chuck body the pins are allowed to move outward radially, causing the chuck to open.

Several sets of pins are provided, each set being carefully gaged for length. To change the chuck from one size of bushing to another it is necessary only to run back the rings (one at a time), lift out the pins and substitute those of the desired length.

Fig. 2 shows the set-up. It is but a matter of seconds for a boy to put a casting in the chuck, and, by inserting a short capstan bar in each ring and pulling them in opposite directions, tighten it up. There is no question but that the casting will run true; there is nothing else for it to do, and as it is supported firmly at both ends real work can be done upon it without danger of its shifting.

The tools are so mounted in the compound rest of the lathe that a facing cut can be taken across the end of the casting and another cut over the beveled surface with no movement other than that provided by the screws of the cross-slide and the compound rest. No attention is paid to size, the only object being to provide a true holding surface.

It has been found that the time of this operation plus the time of chucking the finished casting in the piston-ring machine is often less than that of the latter chucking alone if the operator of the ring machine tries to make the work run reasonably true, and because of the fact that the finished casting can be chucked without effort as near perfectly true as is possible to chuck a casting, the speed of the ring-making operation has been materially increased.

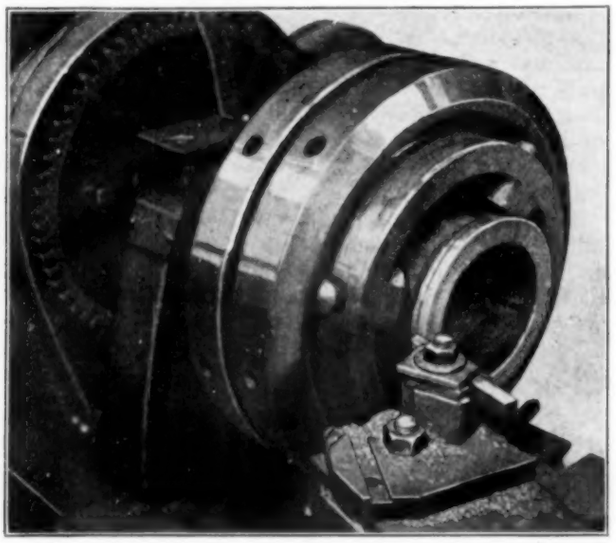
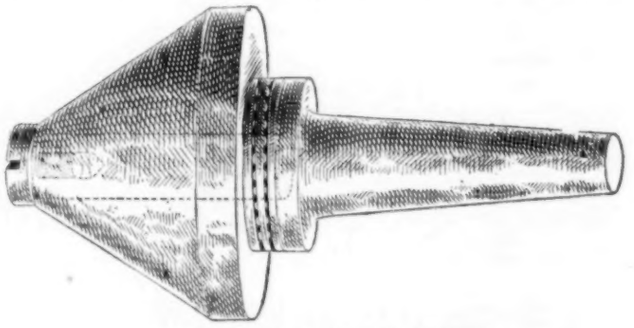


FIG. 2. CHUCK FOR HOLDING "POT" CASTING

The Right Way to Make a Pipe Center

BY T. W. SMETHURST
Bolton, Lancashire, England

On page 752, Vol. 50, of *American Machinist*, M. L. Lowrey describes a pipe center. As the writer's shop experience differs from Mr. Lowrey's, it may add to the reader's fund of information to describe the following way of making a similar tool. The writer has tried all types of pipe centers that he knows of, including Mr. Lowrey's, and with the exception of the one shown in the sketch they have all failed.



A BALL-BEARING PIPE CENTER

The shank of this tool is of cast steel with the journal ground to size. The revolving center is also of cast steel with the hole carefully ground to a working fit on

the journal. A ball thrust bearing is pressed on and the revolving center held in place by a screw of suitable size and shape tapped into the end of the plug.

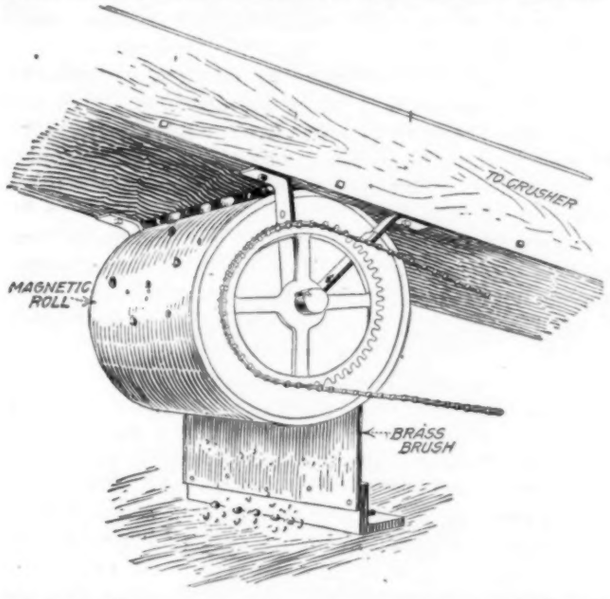
For heavy work of high speeds this type of center is fully recommended, as the following record demonstrates. Thousands of nickel-steel, heat-treated tubes 4½ in. in diameter have been turned on one end, ½ in. of material being removed in one cut with a feed of 48 turns to the inch; also thousands of mild steel tubes have been turned at an approximate speed of 150 r.p.m. —without a failure.

Working on the same job with a center of the type described by Mr. Lowrey it was necessary to dip the center in a bucket of water after each tube was finished, owing to the heat generated, and even with this precaution the center did not last any length of time before it was running eccentric.

Removing Iron and Steel From Coke

By O. F. Kuhlmann

In a local plant considerable trouble was experienced in crushing coke to be used in the furnace, by reason of large pieces of iron, steel, etc., being present, and when these pieces passed into the crusher something



would break. To get rid of this trouble the following scheme was devised:

As the coke came down the incline to the crusher it was made to pass over a magnetic roll and if any steel or iron was present it would cling to the roll. The roll carried it around until it was pushed off by a brass plate used as a brush.

Here some trouble was experienced, too. At first an iron brush was used and when the roll came around with a piece of iron clinging to it, bringing the iron in contact with the iron brush, it would break the circuit to the roll which would then become demagnetized and the piece would drop off; but if at the same instant a piece of iron happened to be passing over the roll there would be nothing to remove it and it would go into the crusher.

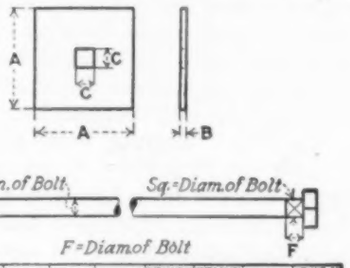
The substitution of the brass plate remedied this trouble; the roll remaining charged all the time the crusher was in operation.

The roll was driven by a chain belt from the crusher and turned about 12 revolutions per minute.

Foundation Bolts and Washers

By George W. Childs

The accompanying data sheet covers information in regard to the foundation bolts and washers used at the



DIAM. OF BOLT	A	B	C	WEIGHT OF WASHER LB.	WEIGHT OF BOLT, 1 FT. LONG INCLUDING HEAD	WEIGHT OF SQ. NUT IN LB.	WEIGHT OF SQ. HEAD IN LB.	WEIGHT OF EACH ADD. INCH OF BOLT LB.
½″	5″	⅜″	⅜″	2.61	0.76	0.085	0.094	0.056
⅝″	5″	⅜″	¾″	2.59	1.21	0.153	0.168	0.087
¾″	6″	⅜″	⅞″	3.74	1.77	0.250	0.273	0.125
⅞″	6″	⅜″	1″	3.71	2.46	0.381	0.416	0.170
1″	6″	⅜″	1⅛″	3.69	3.27	0.552	0.598	0.223
1⅛″	6″	⅜″	1¼″	3.65	4.21	0.769	0.834	0.282
1¼″	6″	⅜″	1⅜″	3.62	5.29	1.03	1.12	0.348
1⅜″	6″	⅜″	1½″	3.58	6.51	1.35	1.46	0.421
1½″	8″	½″	1⅝″	8.68	7.87	1.72	1.87	0.501
1⅝″	8″	½″	1¾″	8.62	9.40	2.17	2.35	0.588
1¾″	8″	½″	1⅞″	8.56	11.09	2.69	2.91	0.682
1⅞″	8″	½″	2″	8.49	12.93	3.26	3.54	0.782
2″	12″	¾″	2⅛″	29.61	14.95	3.94	4.27	0.890
2¼″	12″	¾″	2⅜″	29.37	19.72	5.51	6.00	1.127
2½″	12″	¾″	2⅝″	29.10	24.84	7.49	8.15	1.391

DATA SHEET OF FOUNDATION BOLTS AND WASHERS

Chester, Penn., plant of the American Steel Foundries.

The table gives the necessary data from which the weights of bolts from ½ to 2½ in. in diameter can be computed.

The weights of the nuts and the sizes and weights of the washers are also given.

Army Methods of Selecting Men

By R. V. Raymond

I would venture to offer through your columns a criticism of John T. Clark's idea of a machinist, as set forth under the above heading on page 624 of the *American Machinist*.

I believe the army tests are too elementary but how can a man be classified as a machinist who does not know even the rudiments of the trade, such as lead, pitch, standard tapers, etc. Machine-tool operating is easily learned and probably accounts for the large percentage that can do nothing else.

I have seen "excellent" machinists with years of experience scale a drawing for a taper, spend half an hour trying to work it out to specifications and end by originating a taper of their own. This done, a piece would be hardened and sent to the grinding-machine operator who may or may not have known his business, but who must waste considerable time in either case, in "finding" the taper that the other man made.

This trouble and loss could be eliminated if the machinist possessed a slight knowledge of elementary trigonometry. If a man, having the ability to operate machine tools, can also comprehend and apply the information contained in the *American Machinist's* handbook, he may consider himself an "excellent" machinist. If he aspires to be a toolmaker he should understand advanced trigonometry and analytical geometry.

Training Welders in the Ordnance Department*

By R. J. Kehl†

Originally the shop work of the Ordnance Department was planned to come under two heads: mobile repair and base shops. The mobile shops organized quite elaborate courses of instruction, which were given at the Rock Island Arsenal, Peoria, Ill., and Clintonville and Kenosha, Wis. Because those shops were to be sent to France one at a time, it was quite possible to arrange good courses of training for the men. Men who had some welding experience and men who were good mechanics, but who had no previous experience in oxy-acetylene welding, were given instructions.

In the case of the base shops conditions were entirely different. It was expected that all the base equipment and personnel would arrive in France early in the spring of 1918. These shops, therefore, endeavored to enlist men who had had considerable experience in oxy-acetylene welding, as well as for the other trades required for the shops. It was, of course, understood that there would not be enough first-class operators, but it was thought that we would be able train men in France, using them as helpers to the experienced welders.

When the author arrived in France in March, he went immediately to Advance Depot No. 1. The first machine shop, which had been erected in December, had burned down and the second shop was just about ready to commence operating. Considerable machinery had been damaged in the fire, and a great deal of welding work had to be done before the shop could be run in good shape. When inquiry was made as to why a welder had not been put on the job, the reply was that they did not have one. They had had a blacksmith who claimed to know quite a bit about welding, but he had made a failure of every job which he had attempted, so, although they knew that their only hope for getting the shop running was to employ the oxy-acetylene process, nevertheless they had very little faith in its efficacy.

The only equipment at the depot, was a French combination welding and cutting blowpipe, supplied by a portable acetylene generator of about 25 lb. carbide capacity. Four cylinders of oxygen, and two of acetylene, of about 150 cu.ft. each; about 10 lb. cast-iron rods, all square, and most of them larger than $\frac{3}{8}$ in.; and about 5 lb. square aluminum rod over $\frac{1}{4}$ in., were all the supplies on hand. There was no oxygen regulator with the outfit. A copper tube about $\frac{1}{4}$ in. in diameter carried the oxygen to the blowpipe at cylinder pressure. Lump carbide was the only size available; so it was necessary to break it to charge the generator, as the instruction said, to "the size of coffee."

After the generator had been put in operation and the blowpipe started, it was apparent that a beginner could not be trusted with the apparatus on work that could not be allowed to fail. Therefore, for the first five weeks, the author had to do practically all the welding himself, using the men only as helpers, except for a few cutting jobs.

Soon the mobile shops commenced coming through the depot to receive final instruction in artillery material and other work for which the men were to be specialists with their particular shop. Some of the welders with these shops were excellent operators; some had received instruction in the mobile classes in the United States, but a great many, though classed as welders, knew practically nothing about good welding practice.

Most of the work up to July was repairs to broken machinery and equipment for our own shop, the local railroad repair shop, and other branches of the service at the depot, and some artillery repairs.

The work covered a broad range of repairs and included jobs which ordinarily would not have been attempted. Such parts as typewriter arms, typewriter carriage ways, various small-arms parts, automobile springs, and very badly broken castings were attempted and successfully handled. The only job which failed was a small white-metal casting.

Dozens of levers, arms, handwheels, brackets and pulleys for various machine tools were welded for our own shops each week. For the Air Service, a broken shaper base and aluminum magneto brackets for generator sets were repaired, and some lead burning was done. For the railroad shop, only locomotive brackets, levers, and other small work was welded by us, the larger repair work being sent to the main railroad repair shops, about 150 miles back. For the Motor Transport Corps, cracked engine cylinders, motorcycle forks, worn valves, and other automobile and motorcycle repairs were made.

Perhaps the most complicated job was a three-step cone pulley for a 16-in. lathe countershaft which had fallen from overhead and was broken into 15 parts, all the way from small pieces to one piece about one-third of the pulley. This job required considerable patch work and scheming.

Various parts of gun mounts, gun carriages, and caissons were repaired. Many of these were bronze. Machine-gun tripods, with corners shot off, holes pierced through them, and otherwise damaged, were welded, straightened and put back in service.

The cutting blowpipe was used to cut I-beams for shafting stringers and to rough out large quantities of wrenches for the 75-mm. gun repair tool sets, to save time in machining. The balls and the bases of railroad rails were sliced off so that the machine shops could use the stock to make lathe and shaping machine tools. By careful manipulation of the cutting blowpipe, gun cradles were notched or split, to permit the removal of the gun and recoil mechanism, from field pieces that had been badly damaged in action.

In July, the shops received orders to make up about 200 howitzer mounts, each of which required two butt welds on 2-in. round steel bars, and two corner welds each 15 in. long on $\frac{3}{4}$-in. plate. After the shops had been on this work for about a week, the welders were falling behind because of lack of equipment. At that time, the engineers at the depot received a 100-lb. portable Oxweld generator, with welding and cutting equipment. After considerable negotiations, they finally consented to loan us their generator and equipment on the basis that we would handle all their repair work. When I say that we had eight men doing nothing but breaking lump carbide to the size required for the generator, you will realize that the generators were being heavily taxed.

About the first of May, we received in salvage a good French outfit consisting of a welding torch, a cutting torch, oxygen regulators, and an acetylene regulator. With this better equipment we were able to get along quite well.

*From a paper read at the Annual Convention, International Acetylene Association, New York, July 15-17, 1919.

†Engineer, Oxweld Acetylene Co., Chicago, Ill., formerly 1st Lieut., Ordnance Dept., A. E. F.

EDITORIALS

The Trend of Industrial Relations.

THE general industrial unrest may be considered as the natural aftermath of the great five years' struggle which has just closed. This unrest is world-wide, and the longer it continues the more difficult will be our task of recovering from the burdens of our enormous debt due to the war.

While the industrial unrest is based primarily on the increased cost of living, the wage is not the only question involved—there are other factors which must be carefully considered. Forward-looking business men realize fully that the whole problem of industrial relations has changed greatly during the past five years.

Instead of calling it a struggle between capital and labor, it is more correct to say that it is now a struggle between reactionary capital and revolutionary labor. For, wherever progressive capital and rational labor are coöperating, they are working out many of the problems in a fairly satisfactory manner.

As an evidence of the way in which progressive capital (as represented by four hundred and thirty-three Chambers of Commerce, situated in forty-four states, the District of Columbia, Alaska and Hawaii) has come to consider the labor problem, the following principles were recently adopted by them, with an overwhelming majority:

1. Industrial enterprise, as a source of livelihood for both employer and employee, should be so conducted that due consideration is given to the situation of all persons dependent upon it.

2. The public interest requires adjustment of industrial relations by peaceful methods.

3. Regularity and continuity of employment should be sought to the fullest extent possible and constitute a responsibility resting alike upon employers, wage earners, and the public.

4. The right of workers to organize is as clearly recognized as that of any other element or part of the community.

5. Industrial harmony and prosperity will be most effectually promoted by adequate representation of the parties interested. Existing forms of representation should be carefully studied and availed of in so far as they may be found to have merit and are adaptable to the peculiar conditions in the various industries.

6. Whenever agreements are made with respect to industrial relations, they should be faithfully observed.

7. Such agreements should contain provision for prompt and final interpretation in the event of controversy regarding meaning or application.

8. Wages should be adjusted with due regard to the purchasing power of the wage and to the right of every man to an opportunity to earn a living at fair wages, to reasonable hours of work and working conditions, to a decent home, and to the enjoyment of proper social conditions.

9. Fixing of a basic day as a device for increasing compensation is a subterfuge that should be condemned.

10. Efficient production in conjunction with adequate wages is essential to successful industry. Arbitrary restriction of output below reasonable standards is harmful to the interests of wage earners, employers, and the public, and should not be permitted. Industry, efficiency, and initiative, wherever found, should be encouraged and adequately rewarded, while indolence and indifference should be condemned.

11. Consideration of reduction in wages should not be reached until possibility of reduction of costs in all other directions has been exhausted.

12. Administration of employment and management of labor should be recognized as a distinct and important function of management and accorded its proper responsibility in administrative organization.

The reactionary employer is as dangerous to our welfare as the revolutionary laborite. He is, in fact, largely responsible for the latter. Both are in need of education. The days of master and man have gone by. The other extreme has not arrived. We are living in the present and must demand that our interests be considered by both sides.

The employer who insists on the long work day of the past, and the worker who preaches a four-hour day, are both disturbers of the industrial peace.

The employer whose idea of an open shop is to employ only non-union men is as unfair as the laborite who demands a closed shop. Neither is adding to the welfare of the country. Both are delaying real coöperation.

The Vicious Postal Zone Law

IT HAS been argued that the postal zone increases apply only to the advertising sections of magazines. This is perfectly true as a statement of the mere words of the postal zone law.

It is not true as a statement of facts.

For a periodical or a newspaper is a unit from cover to cover. It is one unit of bulk that is never broken. The argument that the increased postage merely affects advertising is virtually the same as if it were argued that the postal zone legislation had provided that the upper half of a magazine should pay postal zone rates and the lower half flat rates. It would be a mere bookkeeping separation *that would not in the least affect the postage cost to the reader, for the reader*—who is the ultimate consumer—takes the magazine as it comes, and the cost of the magazine is its cost *as a unit*, and its postage cost to him is its entire cost as a unit, no matter how ingeniously or intricately one may subdivide the component parts.

There is one other important factor, also, which I feel many sincere and ordinarily keen-minded citizens have overlooked, and that is, that the magazine and newspaper differ from every other commodity—if you wish to consider newspapers and magazines as merely commodities—in the fact that they are the only "commodities" that are sold to the consumer at less than actual cost of manufacture!

And a newspaper or magazine is the only "commodity" of which this is true.

Now as to the advertising and whether it should pay a higher rate than the body of the magazine. I think I have answered half of that question when I point out that the periodical and newspaper is the only product that is sold for less than its cost of manufacture, and

that this fact is made possible by the advertising. Advertising is nothing but a bulletin board—the bulletin board of our economic, wealth-producing, business life.

Advertising is the one great factor in modern wealth production that enables wealth to be distributed almost instantaneously; a generation or so ago the same result could not have been accomplished without years of hand-to-hand selling and expensive, slow, personal salesmanship. You, as a thinking citizen, know what any restriction upon advertising would do to the wealth production of this nation. Congress itself saw this, and when means of war taxation were being carefully discussed and every channel was being developed, it was deliberately decided that the destructive economic effects that would follow the taxation of advertising would be too great and too dangerous to attempt.

Now then as to the allegations of the cost of transmission of this second-class matter through the mails.

The figures upon which the absurd allegations of second-class deficits are made were compiled by the Post Office Department in 1908 and 1909—eleven years ago! So unreliable were they even then that when the U. S. Postal Commission, headed by the Hon. Charles E. Hughes, investigated them two years after their compilation, they were officially discredited as being no indication of what the costs were for the various divisions of second-class matter! Moreover, the Post Office Department since that date has taken pride in stating that it has in enormous and basic ways cheapened the postal cost of second-class matter.

The most unfortunate part of this postal zone legislation is that it is an insidious and dangerous attempt to set back postal history seventy years and reëstablish the universally condemned principle of postal cost determining the postal rates. *It abolishes the sound postal principle of equal postage to all parts of our nation.* The rural free delivery—one of the most vital and important postal functions—is conducted at almost a total loss, and if this vicious and unsound cost principle is once established the demoralization of our splendid postal principles is only a matter of logic and time.—*Senator Arthur Capper.*

The Sense of Personal Responsibility

MUCH is being said and written about the scarcity of trained men at this time when training is universal; when the untrained man is supposed to be the exception rather than the rule.

Boys of the present generation can scarcely escape the "training" which has become the fetich of modern educational institutions and educators. Every town has its "vocational" school; every manufacturing establishment of any pretension, its "training department." Magazines and periodicals of all kinds carry advertisements of private "schools" and "colleges" that will undertake, for a consideration, to "train" young men to any trade or profession, from doctor to sky-pilot; from caisson worker to aviator; and yet there is the continual wail for "trained" men.

We have discarded the haphazard methods of the College of Hard Knocks, and substituted therefor the studied sequence of Scientific Training. We should under the present standards turn out in from three months to three years fit practitioners in any field; yet we have felt the need of trained men for much more than the three years necessary to supply that need, and it is not supplied.

We have machinists who constantly handle tools their grandfathers never dreamed of, and who, thanks to modern machinery and methods, could turn out if they would a greater production in days than their predecessors could in weeks; still, machinery cannot be produced fast enough. We have farmers whose scientific knowledge of nitrogens, phosphates, and other mysterious things that enter into plant life would have shocked their grandsires into hysterics; farmers who, theoretically, should not only make grow two blades of grass where one grew before, but a bushel of potatoes as well; yet potatoes cost about the same now per peck as they used to per barrel.

We have the machinery; we have the men; yet we feel the pinch of lack of production and we howl about the necessity for further "training." Is it lack of training, or have we, in throwing into the discard the School of Experience, thrown with it some subtle quality the presence of which we did not realize, but which is absent from the curriculum of the School of Scientific Teaching.

The School of Experience—the College of Hard Knocks—is (or was) proverbially a drastic teacher, but from its primary grade to its post-graduate course it taught personal responsibility; it taught boys to be *men*, and nowhere in its intricate mazes could be found the modern study of Passing the Buck.

In the old days if an apprentice boy spoiled a job he felt meaner than a "yaller" dog. The school product of today would laughingly charge the fault to the steel foundry, the tool builder, or the man who wrote the scenario for the current moving picture; and tomorrow he would make the same mistake again.

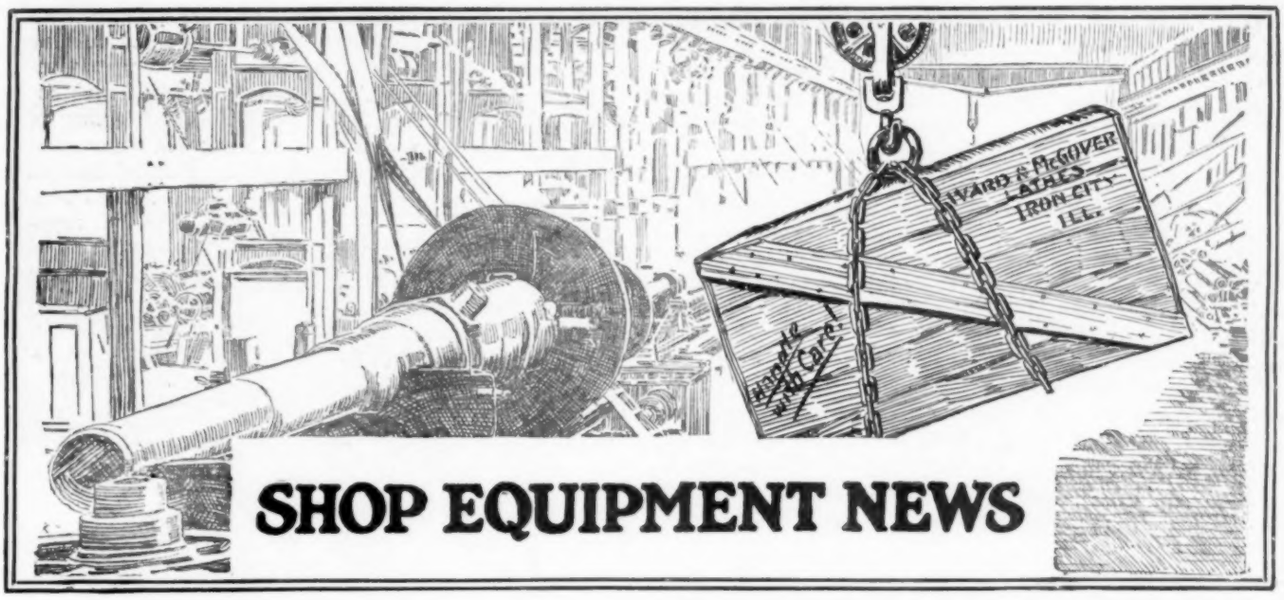
Twenty-five years ago, if a railroad train was late, every member of the crew from Eagle-Eye to Hind Brakie was in disgrace, and each made a firm mental resolve that it shouldn't happen again—and it usually didn't. Now-a-days, if a train is on time, it is considered an accident. (This, too, seldom happens.) To be late is a joke.

Ten years ago the United States Government built in New York City a magnificent new post office, and over its portal inscribed this motto, "Neither rain nor snow nor heat nor gloom of night stays these couriers from the swift completion of their appointed rounds;" and now—but what's the use.

According to our present standards, if the convenience, comfort, or even the lives of any considerable portion of the community depend upon any group of individuals, that group sees in the condition only an opportunity to fill its pockets at the community's expense. Men who would see red at the thought of robbing a child of its dinner will calmly vote to go on a strike that will put the milk bottle forever beyond the reach of thousands of babies. Men who on a cold winter's night would not refuse a hobo the means to procure warmth and comfort will deliberately maneuver to hold up coal production, causing incalculable misery and suffering, in order that they may gain a temporary advantage.

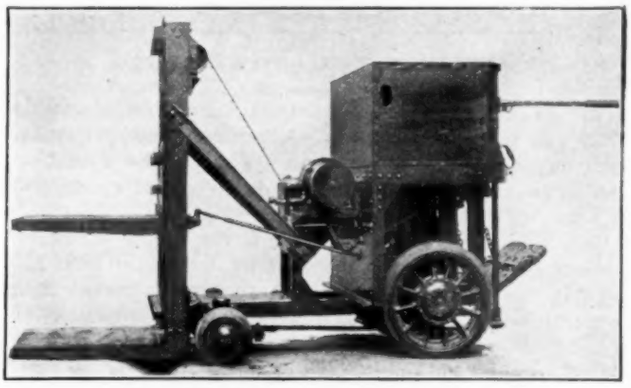
The crying need of the times is not more training so much as a better quality of training; the kind of training that instills into the mind of man a sense of his own accountability; that teaches him that the evils from which he suffers are but the progeny of the evils he has perpetrated upon others.

We need a training that will make men understand that the doctrine of "all for everybody and everybody for all" is capable of getting better results for the individual than that of "everybody for himself and to h—l with the hindmost."



Elwell-Parker Tiering Truck

The Elwell-Parker Electric Co., Cleveland, Ohio, has placed on the market a combination truck for transporting and lifting as shown in the accompanying illustration. This truck is driven by an electric motor from storage batteries and the drive is by single reduction worm gearing. The hoist is operated by a separate inclosed-motor, direct-connected to the hoisting drum.



ELWELL-PARKER TIERING TRUCK

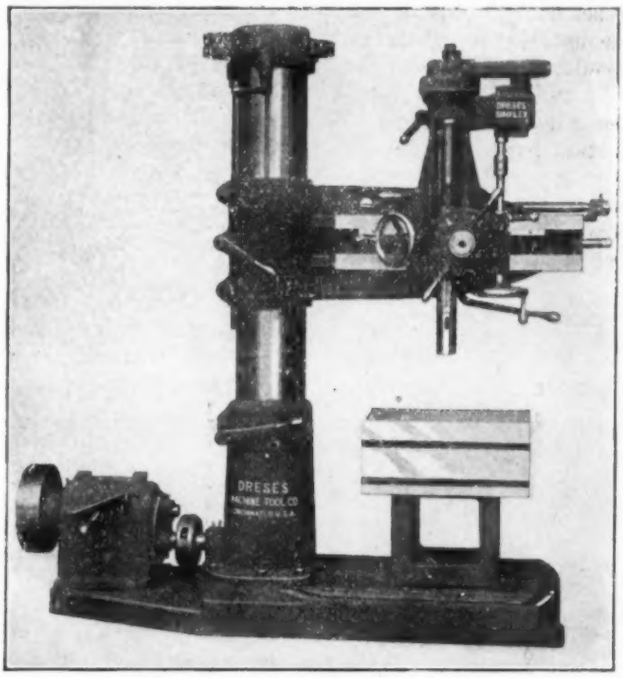
Specifications: Speeds: 3 in either direction, 375 to 525 ft. per minute; load capacity, 1000 lb.; minimum distance, platform to floor, 2½ in.; lifting height, 5 to 6 ft.

The platform uprights are provided with rollers, the whole being guided by upright channel irons. A limit switch automatically stops the elevator at the extremes of its travel. The wheel base is short and as all four wheels are used for steering, the truck may be handled in congested places. All the wheels have rubber tires.

Dreses Simplex Radial Drilling Machine

The Dreses Machine Tool Co., Cincinnati, Ohio, has placed on the market a line of radial drilling machines, one size of which is shown in the illustration. The machines are said to meet the demand for simple machines that can be operated by untrained help and that they lack none of the features necessary for rapid production.

The outer column swings on a fixed inner column of the same height. Both columns are enlarged at the lower ends, and, besides having the usual bearings at top and bottom, they have a bearing in the center to give strength and rigidity. The outer column rests on a ball bearing on top of the inner column to insure easy swinging. The clamping handle swings with the arm and is always in reach of the operator. The arm is parabolic in shape to give resistance to bending and torsional strains. It is raised and lowered by gearing



DRESES SIMPLEX RADIAL DRILLING MACHINE

having a ratio of two to one and controlled by a conveniently located handle which is locked to avoid accidental engagement of the gears.

The spindle runs in bronze bearings and the thrust is taken by a ball bearing. The feed rack is cut on the sleeve, bringing the feed pressure close to the center and affording a wide gear surface without reducing the sleeve bearing in the head. The feed, which is by steel worm and bronze wormwheel, has four changes controlled by a knob on the feed shaft. The wormwheel

runs in an oil bath. Feed and speed plates are attached in conspicuous places. The automatic stop is of the dial type and a safety release at the end of the rack is provided. The friction for starting, stopping, and reversing, together with the necessary gears, is inclosed in the back of the head and run in an oil bath.

The speed variator has six changes and is provided with a shock absorber to overcome the jar in making the changes. The gears in the variator are of the 20-deg. pointed type for easy engagement. The quick return can be operated with either of the two handles with which it is furnished. The drive is by helical metal and fabric gears and is said to be noiseless. All cylindrical bearings are lined with removable bronze bushings.

These machines are built with 2½- and 3-ft. arms, and the principle dimensions of the 2½-ft.-arm machine are: Maximum distance from base to spindle, 51 in.; traverse of spindle, 11 in.; diameter of column, 9 in.; feeds, four, 0.007 to 0.018 in.; speeds, eighteen, 83 to 575 r.p.m.; weight, with 2½-ft. arm, 3100 lb.; 3-ft. arm, 3400 lb.

Cowan Metal Feet for Transveyor Skids

The Cowan Truck Co., Holyoke, Mass., has lately placed on the market the metal feet for transveyor skids as illustrated herewith. The feet as shown in Fig. 1 are made of cast iron and may be easily attached to

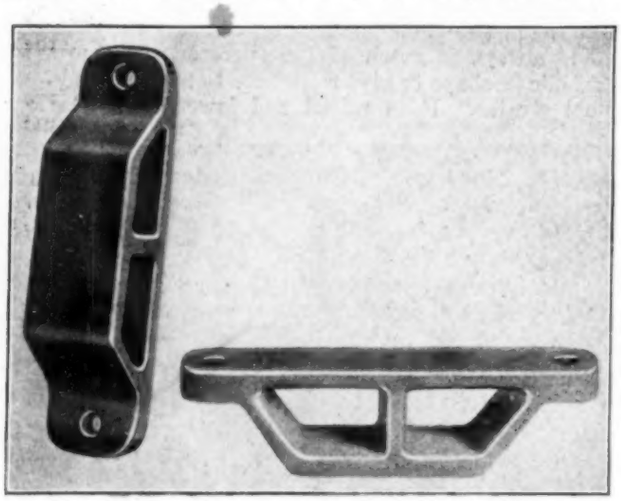


FIG. 1. COWAN METAL FEET FOR TRANSVEYOR SKIDS

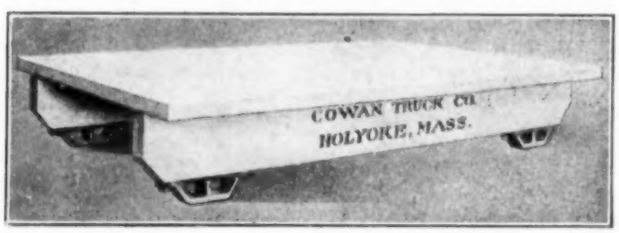


FIG. 2. TRANSVEYOR WITH METAL FEET ATTACHED TO THE SKIDS

skids of any size. It is claimed that their use will more than double the life of the skids. Fig. 2 illustrates a transveyor with the metal feet attached to the skids.

General Electric Rivet Heater

The General Electric Co., Schenectady, N. Y., has placed on the market an electric rivet heater which is shown in the illustration. The device consists of a 15-kw. transformer mounted on angle-iron legs which can be fitted with wheels, two copper bars fitted with heavy air-cooled electrodes of cast copper and underneath these a copper block which acts both as a support and an electric connection for two rivets in series.

When the rivets are stood up on the block and the electrodes allowed to drop on their heads, the electric circuit will be completed and the heating will begin. The electrodes may be raised independently, each by its own

GENERAL ELECTRIC RIVET HEATER

pedal, gravity being sufficient to lower the electrode when the pedal is released. A primary tap switch on the back of the device provides for all the variation needed for different lengths and diameters of rivets and the rate of heating desired.

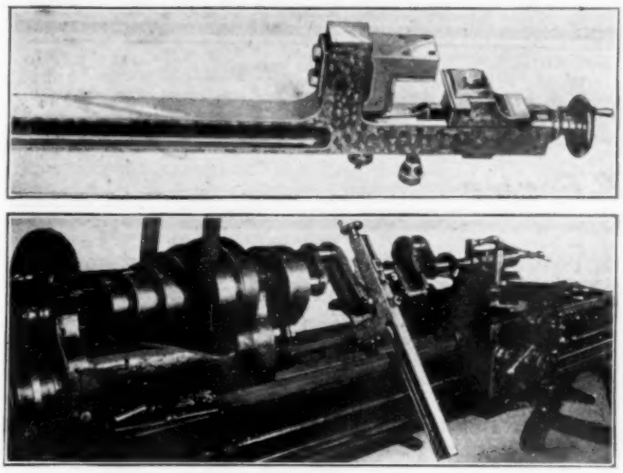
The maker of this device claims for it the following advantages: Higher efficiency of localizing the heat energy in the rivet with less heat radiation; better heat regulation in proportion to quantity of rivets used; high economy, as current is only used when heating rivets; cleanliness, as no smoke or grease is formed; no time wasted in starting production; better quality of heat with less formation of scale; rivets heat from inside out, giving more uniformity of heat and better upsetting conditions; heater is portable and, as but two power lines are required for each heater, all piping for oil, air or gas is eliminated.

The sizes of heaters so far developed are 5 kw. for rivets up to ½-in. diameter and a 15 kw. for rivets up to ⅞-in. These heaters are intended for one-gang use, though it is claimed that the 15 kw. in actual test heated five hundred ½ x 1¼-in. rivets in one hour, which is ordinarily enough for two gangs of gun riveters.

Weber Crankpin Returning Tool

The Sawyer-Weber Tool Manufacturing Co., 350 South Alameda St., Los Angeles, Calif., has placed on the market a tool for re-turning crankpins as shown in the accompanying illustration, which shows the tool at the top and the manner of using it at the bottom. Different form cutters are furnished to suit the lengths of crankpins to be re-turned.

This tool is made in four sizes as follows: No. 1,



WEBER CRANKPIN RE-TURNIN G TOOL AND METHOD OF USING IT

for pins 1⅛ to 3 in. in diameter by 1½ to 3 in. long; No. 2, for pins 1½ to 3 in. in diameter by 2 to 4 in. long; No. 3, for pins 1⅞ to 4 in. in diameter by 2¾ to 5 in. long, and No. 4, for pins 3 to 6 in. in diameter by 3½ to 7 in. long.

What Is a High-Grade Machine?

The following letters give the impressions and convictions of leading machine-tool builders as to what constitutes a high-grade machine. Several of the replies to the editorial on this subject which appeared in the issue of Aug. 7, 1919, will appear as separate articles.

NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION, WORCESTER, MASS.

I would say that when we speak of a "high-grade machine" we mean a machine that has proved itself reliable both as to quality and workmanship. When you go beyond these two essentials you only add the frills which are many times trappy and unserviceable, although good talking points in sales.

Good material, reliable, accurate workmanship, give any machine a high-grade reputation, just as character and reliability stamp the high-grade individual.

CHAS. E. HILDRETH, General Manager.

THE ROWBOTTOM MACHINE CO., WATERBURY, CONN.

I would understand by the term "High-Grade Machine" one with the following qualifications: First-class workmanship with good, practical fit; rigidity enough to stand up to the work required of it; little details provided to make the machine ready for service without delay after installing; one that will stay accurate for a reasonable time and require the minimum amount of repairs; one showing care taken to have the final finish attractive.

GEO. ROWBOTTOM, President.

FRED J. MILLER, NEW YORK

I had not thought that there was any particular difficulty in arriving at an understanding as to what constitutes a high-grade machine; an understanding, I mean, which would answer the purpose in any given case.

I do not think, however, that any definite rules can be laid down by which or in accordance with which a high-grade machine may be certainly distinguished from a lower-grade machine. The meaning of all such terms depends a great deal upon who uses them and upon his own standard or conception of their meaning. When a man speaks of a machine as being high-grade we must know something of the man who makes the statement and something of his experience; else we cannot judge as to whether or not his conception of high grade agrees with our own. It is the same as the expression "first-class workmanship," which means next to nothing unless one knows the shop in which it is done or the standard of the speaker.

I should say, however, that a high-grade machine would be one concerning which it would be generally agreed by users and by experts acquainted with the class of machinery to which it belongs, that, in design, material and workmanship the machine compares favorably with other machines in its class.

This, in itself, will generally be a fluctuating standard because by it a certain machine generally agreed to be high grade may, if it is not improved, become low grade by the improvement of other machines in its class, simply because it has become relatively of a lower grade of design and workmanship, thought not absolutely so. In other words, the standard by which it is judged has changed.

Many years ago Chordal, in writing on the subject of first-class workmanship, pointed out that first-class workmanship was not necessarily a matter of close fitting or of high polish or exactitude, but that first-class workmanship involved good judgment as to what kind of work was called for by the conditions under which it was done or under which the machine was to operate. And he summed it up by saying that a crocus finish on a hand car crank would be not good workmanship, but bad workmanship, because entirely out of place.

FRED J. MILLER

Why Baxter Could Only Make Six Tanks

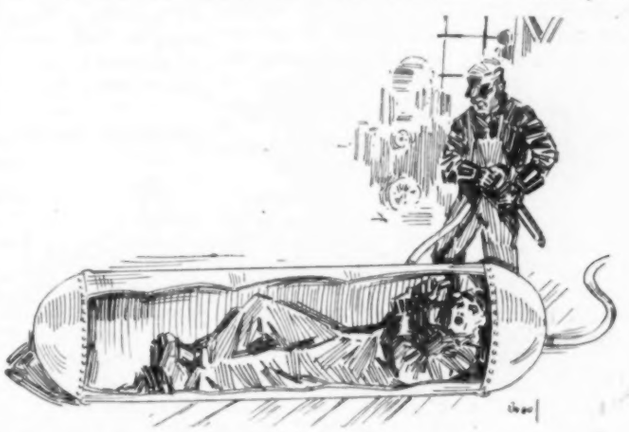
BY JOHN R. GODFREY

The designer, whom we'll call Jackson because that wasn't his name, was a good sort, but he was shy on shop practice and sometimes slipped a cog or two on that account. Orders came for a lot of air tanks, about 30 in. in diameter and 8 ft. long, and Jackson got the drawings out in a hurry.

It wasn't long before the head boilermaker came into the office, and Jackson asked him how soon they could begin turning out some of the tanks.

"That's what I came to see you about, Mr. Jackson. I can make six of those tanks in short order, but that's all. Can't make any more unless I get a new crop of boilermakers."

"What d'ye mean, Baxter—new crop of boilermakers—why can't you make the whole lot with the men you



have as well as to make only six? Quit your joking and go get busy."

"Well, you see, Mr. Jackson, that blueprint calls for hemispherical heads on both ends. They've got to be riveted up with a man inside. Now I've only got six men to put inside for the holders-on. When they are riveted up inside, I'm done—see.

"Now, if you'll just change that design so one head bulges in—so the second head can be riveted from the outside—I can get the whole lot out in short order."

And he left the blueprint on Jackson's desk, dodged an ink well as he went out, and went to the purchasing agent to order the material.

This is our delayed issue of Nov. 6, 1919. This news is however up to date, having been prepared for our Nov. 20 issue

Sparks from Industry's Forge

Edited by E. C. Porter

Trade Currents from Cleveland Machinery District

Practical settlement of the coal strike is already reflected in renewed buying interest in the Cleveland machinery field. The latest development is the announcement that many Michigan automobile interests now propose to double their 1920 production, which will mean, practically doubling their present producing capacity. Incidentally, both nearby and out-of-town diversified manufacturing industries are planning to increase their output, for many of these are allied with motor-car production. Forerunner of this improved business is seen in the the recent purchase of one and two machines, some of large type, to fill in for present needs. It is significant that there is less shopping and inquiry in the trade —that class of inquiry which is not followed up by orders—than there was up to two months ago. Purchasers are coming direct to manufacturers and distributors, and placing their orders where they know the equipment is to be had at once or within a reasonable space of time. For this reason the market at the moment is devoid of anything spectacular, and the sensational is equally lacking because there is no new large plant layout in prospect at the moment. Much of the business now coming forward, leaders in the industry point out, is the result of larger contracts being placed with general manufacturing, and the equipment is required to speed delivery on these enlarged contracts.

Successful carrying on of business through the winter is admittedly dependent upon the normal resumption of steel delivery. The Cleveland steel industry continues to show daily improvement. Production is claimed to be about 50 per cent. of normal. The latest plants to resume operations in this district are the foundries connected with the Crucible Steel Forge Co., Vitreous Enameling Co., E. F. Hauserman Co., National Steel Barrel Co., Grabler Manufacturing Co., Superior Foundry Co., Allyn-Ryan Foundry Co., and the Atlantic Foundry Co. Most of these are located in the Newburg district. Officials state that practically every man who walked out has returned to work. At this rate it is expected that there will be sufficient material coming forward from all sources at an early date to meet any shortage that may develop in manufacturing circles with the gradual reduction of surplus stock acquired at the outset of the steel strike. There is still plenty of steel stock in machinery makers' hands, according to several leading manufacturers.

Effort to organize an export managers' association for Cleveland has been started by the foreign-trade committee of the Cleveland Chamber of Commerce. It is planned to complete such an organization preparatory to the completion of the Welland Canal three years hence, when Cleveland will become an ocean port in the true sense. It is pointed out by Chamber officials that Cleveland will have the double advantage of being a manufacturing center as well as having the shipping facilities to send its products abroad. Already, as has been stated, leading machinery manufacturers of this city are being strongly represented in foreign countries, although immediate results in business being placed have not met with the expectations that arose with the ending of the war. Members from out of town who have been arousing interest along this line here recently are H. B. Gregory, former president of the Export Managers' Club of New York, and G. C. Vedder, of the Boston Round Table.

A new representative in Central West territory for the Cleveland (Ohio) Milling Machine Co., is announced this week in the appointment of the J. H. and F. A. Sells Co., Columbus, Ohio, which will handle the Cleveland line of milling cutters in and around Columbus.

The Cleveland Duplex Machinery Co., Cleveland, Ohio, has taken over the surplus equipment of the American Multigraph Co., which is valued at about $65,000.

Seventh National Foreign Trade Convention

One of the important features of the Seventh National Foreign Trade Convention, to be held at San Francisco, Calif., May 15 to 20, 1920, will be the world conference of American foreign traders, according to preliminary announcements just mailed to American firms represented at previous conventions, who are requested to have their representatives, living or traveling abroad, time their visits to this country so as to take advantage of the valuable opportunities afforded by this convention.

Three special steamers, chartered for the accommodation of delegates from abroad, will be provided for the ports on the Pacific Ocean. Another steamer starting from New York, will go by way of the Panama Canal.

Information regarding steamer routes, days of sailing and the program of the 1920 convention, is being furnished by O. K. Davis, secretary, National Foreign Trade Council, No. 1 Hanover Square, New York.

Our London Correspondent Writes of Trade Conditions in England

Paralysis is slowly creeping over the engineering industry, more particularly the heavier side—the reason being that the iron-founders' strike is preventing the production of castings in England. Overshadowed for a short period by the general railway strike, the foundry trouble was thought to be settled on the same terms; namely, the fixing of wages at present rates for practically another year. The workmen, of course, have been demanding an increase of 15s. a week and 7s. 6 d. for lads, and they rejected the terms suggested as a compromise, in some areas no single vote being recorded in favor of them. Whether justifiable or not, when made in June last, the claims of the molders and allied tradesmen have not been weakened by the passage of time. For, accepting at face value official figures. the rise above pre-war level of the cost of living, which was 105 per cent. four months ago, is now 120 per cent. The iron founders as workmen have long been of a somewhat unprogressive character, and, apart from restriction of apprentice troubles, etc., they have steadily set their face against payment by results.

Objection to this system of payment in fact steadily grows in Great Britain, where the whole industrial system seems to be in a state of flux. Many workers are stretching out possibly to another system which is not yet mentally envisaged. Certainly, insistent claims are being made for increased participation by direct producers in the management of industry. Many workmen too are pressing for the elimination of women from the engineering workshop. Tolerated for the purposes of the war, the woman is not to be allowed to "do the man out of his job" in peace times and, whether it be fare-taking on tram cars or undertaking simple operations in small tool, machine-tool or engineering works, women are to be removed.

The effect of the molders' strike on engineering firms varies naturally with the demands made by the latter for castings and the store in that direction they had been able to accumulate. A visit to Manchester a day or two ago found one or two works on its machine-tool side almost shut down. Others were working four days a week, and some even only three days a week, in an endeavor to eke out their resources. But if the strike continues, sooner or later all must close and engineering will be brought to a standstill. Despite all handicaps, orders are

being steadily placed for machine tools They relate very largely to the production of automobiles and cycles of various forms, but more than one firm has found it advisable to specialize in the production of tools for railway shops. The railway strike certainly helped the commercial vehicle industry, demonstrating its convenience in an emergency; but it must be confessed that, among the calculations that have been made, few seem to take into account the effect of this traffic on the roads themselves. As to machine tools, the market in automatics is for the time being almost in the hands of agents for American makers. The Gridley single-spindle machine is of course being produced in the Stockport district, but except for one or two small makers of home designs British firms are avoiding this type of tool, the only considerable maker being, according to rumor, about to give up.

Midland reports state that billets and blooms from Alsace-Lorraine are being sold at about £1 a ton less than British products; some complaint is made as to quality. American competition has reduced the price of iron strip by 30s.

The Shipping, Engineering and Machinery Exhibition held at Olympia, London, W., between Sept. 25 and Oct. 21 inclusive, attracted an unusually large number of visitors, having in view the fact that the railway strike occurred in its early days and thus handicapped it badly. In fact on Saturday afternoons it recalled Sundays at the Paris Motor Show. Though shipping was not greatly in evidence, the hall was completely filled, largely with marine engineering and similar accessories, while of shop processes, electric, oxy-acetylene, etc., methods of welding and so on were demonstrated. The combined Dutch section was a feature. Little that was new was displayed, but the exhibition served as a good general introduction to other special exhibitions which will be following. Though not unrepresented, comparatively few machine tools were shown; the Barber & Coleman Co., for example, had one or two machines on its stand.

The exhibition was frowned on by the Machine Tool Trades Association, which has its own show to be held at the same place next September. The exhibition committee of the Association recently "decided that no machines of German or Austrian origin may be shown at the exhibition next year," and this committee has retained for itself "the right to insist on the removal from the exhibition of any machines which in the judgment of the committee come under the above description." The stands are to be arranged with a view to the best general effect but there is no insistence on uniformity of design. It is significant that special notice has been sent of increase of charges specified for electrical power, though "at the moment it is not possible to state what the charges will be at the time of the exhibition."

Trade Commissioner Will Tour American Industrial and Exporting Centers

After eight months spent in studying the industrial machinery situation in France and Belgium, Charles P. Wood, trade commissioner of the Bureau of Foreign and Domestic Commerce, Washington, D. C., has returned to this country and will now tour the industrial and exporting centers of the United States, to discuss with manufacturers the European situation.

How to take advantage of opportunities in France and Belgium, in the face of the present adverse exchange situation, has perplexed American machinery manufacturers as well as their bankers and financial associates. Mr. Wood, who is an experienced engineer, is considered well informed on the European machinery situation.

The itinerary for his trip is as follows: New York, Nov. 17 to 22; Boston, Nov. 24 to 26; Pittsburgh, Nov. 28 to 29; Cincinnati, Dec. 1 to 2; Cleveland, Dec. 4; Detroit, Dec. 6; Chicago, Dec. 8 to 11; St. Louis, Dec. 12 to 13; Chattanooga, Dec. 15; Birmingham, Dec. 16; Atlanta, Dec. 17.

Disposition of Surplus Machine Tools under New Sales Plan

Details of the method of disposing of surplus machine tools held by the War Department are now being revised under the direction of A. A. Fuller, newly appointed chief of the machine-tool section. Under the sales plan which is now being worked out and which will be instituted very soon, the appraisal and price-fixing charts, formerly prepared by the section, will be abandoned. Thousands of machine tools were sold by the Government departments through the machine-tool section to the domestic and foreign trade on the fixed-price basis.

The system that will be inaugurated shortly will include a fixed minimum charge, based upon a physical appraisal or valuation of the surplus machine tools now located in the various districts and held by the various branches of the War Department. Men have already been sent into the field to appraise machine tools where sufficient data has not been made available to the office in Washington.

The plan as contemplated, will, it appears, permit of a certain amount of higgling with Government officials as to the final price paid for surplus machine tools. This price in every instance will not be lower than a fixed minimum charge decided upon by the appraisal now being conducted in the various districts.

The machine-tool section will soon issue a bulletin giving a full description of the material available for sale.

V. C. Kylberg, assistant chief of the machine-tool section, is making preparations to handle the machine tools made available to schools and colleges by the passage of the Caldwell Bill. Mr. Kylberg estimates there are now on hand approximately 500 inquiries from various institutions throughout the country regarding tools for educational institutions.

The machine-tool section recently received an inquiry from a firm in Australia that wanted to purchase some of the surplus equipment handled by that section.

Prentiss Company Training Its Foremen and Factory Supervisors

G. W. Prentiss & Co., Holyoke, Mass., has inaugurated a plan of training for its foremen and other factory supervisors which is of considerable interest. A group of 25 men has been formed to pursue a three-month course in modern production methods, which comprises the study of specially prepared text units, the solution of problems relating to the units, and the discussion of this material at six biweekly meetings held after hours in the plant.

At each meeting a lecture will be delivered by an experienced production man and the lectures will be followed by a round-table discussion. Included in the group, besides foremen, are the general manager and the superintendent, which insures that the meeting will be highly resultful to the members of the class. The subjects to be studied are:

How to promote team work in the shop; handling men in a way to increase production and promote harmony; how production should be organized; efficient purchasing, scheduling, routing, repairing, etc.; keeping down the overhead by stricter cost keeping; major problems of management.

Coming S. A. E. Meetings

Because of the general nature of the Annual Meeting of the Society of Automotive Engineers during the New York Automobile Show, several later meetings have been arranged to deal with more specialized topics.

At Chicago a truck and tractor meeting will be held at the Hotel La Salle on January 28, in conjunction with the Chicago Automobile Show. Another Chicago meeting has been planned by the Mid-West section in co-operation with the society. This will be an aeronautic meeting scheduled for Jan. 13, during the Chicago Aeronautic Show.

The annual tractor dinner will be held at the Hotel Baltimore, Kansas City, on Feb. 12. This date falls in the week of the Kansas City Tractor Show.

The following section meetings have also been scheduled: Nov. 20, Metropolitan section at Hotel Commodore "Trend of Body Design"; Nov. 21, Cleveland section, Hotel Statler, "Symposium on Wheels"; Nov. 25, Pennsylvania section, Arcadia Cafe, Philadelphia, "Tractors"; Nov. 28, Detroit section, Hotel Ponchartrain, "Automotive Situation in the Allied and Associated Countries"; Dec. 11, Metropoli-

tan section, Automobile Club of America, "Torsional Vibrations and Critical Crankshaft Speeds"; Dec. 19, Detroit Section, Hotel Ponchartrain, subject not yet announced.

Personals

Walter Chrysler, vice president and general manager of the General Motors Co., resigned Nov. 1.

GEORGE T. SWIFT has been appointed superintendent of the Nazareth Foundry and Machine Co., Nazareth, Penn.

FRED. GEBHAUER has been appointed special Navy Yard representative of the Chicago Pneumatic Tool Co., with headquarters at its Philadelphia office, 1740 Market St.

M. J. Armstrong has resigned from the McMullen & Armstrong Co., Ottawa, Ont., Can., and opened a machine shop at 186 Queen St., Ottawa, Can., under the name of Armstrong & Co.

George R. Wetten, formerly with the Cyclops Steel Co., Titusville, Penn., and the Atlas Steel Co., Dunkirk, N. Y., is now associated with the Hess Steel Corporation, Baltimore, Md.

Capt. Joseph R. Greenwood having recently received his discharge from the U. S. Army has renewed his associations with the firm of Charles H. Higgins, 19 West 44th St., New York City.

S. E. WEAVER, for the past several years manager for the Union Twist Drill Co. in eastern Pennsylvania and southern territory, has joined the sales force of the Davidson Tool Manufacturing Co., New York City, and will represent it in a similar capacity in this territory.

Arvid E. Nissen, who has been employed in the openhearth department of the Illinois Steel Co., Gary, Ind., and also assistant metallurgist for the Taylor-Wharton Iron and Steel Co., Highbridge, N. J., is now assistant superintendent of the melting shop for the Hess Steel Corporation, Baltimore, Md.

Charles F. Scribner, formerly industrial engineer with the Colt's Patent Fire Arms Manufacturing Co., Hartford, Conn., and more recently consulting engineer for L. V. Estes, Inc., Chicago, Ill., has become associated with the Business Service Corporation of America, Chicago, Ill., in the capacity of vice president and chief engineer.

New Publications

An American Labor Policy. By Julius Henry Cohen. 110 pages, 5 x 7½ in.; published by the MacMillan Co.

This book is one of the many which should be read by all who are truly interested in the real development of industry, it being the earnest hope of the author that "the analogies and the definite experiences herein put forth will help to save our country from a crisis which he believes to be as imminent as was the European war five years ago."

The author believes that the next great task of civilization is to convert industrial anarchy into industrial law. He points out that "however just the cause, however righteous the indignation, it is the lesson of all history that possession of unrestrained power leads ultimately to the destruction of personal liberty and the defeat of the very cause which altruistic agencies of power sought to promote." The book is a well-written and consistent plea for better relations between employer and employed; for a careful consideration of the human element in industry; for the elimination of strikes and lockouts, and the increase of production which shall be more equitably distributed than has been the case in the past.

The author quotes very liberally from various authorities, the following being from the New York Chamber of Commerce, Committee on Industrial Problems and Relations:

"It has been proved over and over again in industry that, irrespective of such conditions as rate of wages paid, as cost of management, or as rate of interest or other return on capital, the conditon of hearty coöperation outweighs all the others. In this we find the moral factor of manufacturing, which outweighs all the physical forces."

Among the conclusions reached by the author are that labor must be organized and must be permitted to join in the management of industry; that employers must also be organized; that there must be a determination of the standards and working conditions of each industry, preferably through the action of groups of employers and of workers; that there must be full opportunity for the redress of all grievances, and provisions for securing to the worker a reasonable tenure of employment. He also advocates a limitation of the free right of discharge, and also of the free right to strike, believing that by the process of free negotiations the two rights can be fairly balanced, as has been done in the past.

Business Items

The I. H. Dexter Co., Inc., will on Dec. 1, 1919, move its office and plant to its newly acquired building at Goshen, N. Y.

The Millholland Machine Co., Indianapolis, Ind., has announced the opening of a branch office at 111 Broadway, New York City.

The American Forge and Machine Co., Canton, Ohio, has recently added another steam hydraulic forging press to its forge shop.

The Lancaster Structural and Foundry Works, Lancaster, Penn., has purchased the property of the Lancaster Machine and Structural Works.

The Business Service Corp. of America, Springfield, Ill., has opened an office at 29 South La Salle St., Chicago, Ill. Charles F. Scribner is vice-president and chief engineer.

The Carborundum Co., Niagara Falls, N. Y., has announced the opening of a branch office and warehouse in the Burkhardt Building, Second and Larned Sts., Detroit, Mich. Anthony Dobson will have charge of the sales district.

Parsons-Moorhead Machinery Co., Hostetter Building, 237 Fourth Ave., Pittsburgh, Penn., has recently been organized to do a general machinery business. William J. Moorhead was formerly vice president of the Duquesne Electric and Manufacturing Co., while Mr. Parsons has been doing a general machinery business for several years.

The Gairing Needham Tool Co., Detroit, Mich., has announced that its name has been changed to the Gairing Tool Co., Inc. Mr. Needham has severed his connections.

Republic Creosoting Co., Indianapolis, Ind., has moved its Philadelphia office to larger quarters in the Real Estate Trust Building. H. G. Stephens is still in charge.

The Erie Tool Works, 640 West 12th St., Erie, Penn., has purchased from the Government the Brown Folding Machine Plant, 11 and French Sts., for $85,000, and will move into its new quarters about Dec. 1.

The Rivett Lathe and Grinder Co., Brighton District, Boston, Mass., has let a contract for the construction of a three-story building, 200 x 60 ft. The building which is to be reinforced concrete, will be used for manufacturing and will cost approximately $100,000.

The Dickey Steel Co., Inc., Woolworth Building, New York City, has been appointed Eastern sales and export representative of the Hammond Steel Co., Inc., Syracuse, N. Y., manufacturers of high speed alloy and carbon tool steels, etc.

The Cleveland Twist Drill Co., Cleveland, Ohio, has prepared a four-reel motion picture entitled "The Twist-Drill—Its Uses and Abuses." This picture deals with the fundamental principles of all drilling and is designed primarily to show before machinists, drilling-machine hands, foremen, clubs, etc.

The Ingersoll-Rand Co., 11 Broadway, New York City, has established a branch office in the Sam Houston Life Building, Dallas, Texas, in charge of R. H. Brown, Jr., as manager. Mr. Brown will cover the Texas and Oklahoma territory. He has heretofore been connected with the company's St. Louis office.

The Isco Co., Chicago, Ill., manufacturer of the Isco refrigerating machines, opens its Wisconsin branch office on Oct. 15, at 110 Mason St., Milwaukee, under the name of the Isco Wisconsin Co. R. M. Jones is the manager.

Trade Catalogs

Black and Decker. Black & Decker Manufacturing Co., Baltimore, Md. Catalog; pp. 32; 8½ x 11 in. This catalog describes the company's electric air compressors, portable electric drills and electric valve-grinding machines in detail. Specifications and prices are included.

Industrial Transportation. Bicycle Manufacturers' Association, 36 Pearl St., Hartford, Conn. Booklet, pp. 32; 10 x 7 in. This booklet has been issued to call attention to industrial concerns as to the advantage of a bicycle as a method of transportation for workingmen and women. Several illustrations are given of the storage provided for the use of the employees in large manufacturing plants during working hours.

Rollway Pumps. Michigan Machine Co., Detroit, Mich. Catalog; pp. 7; 9 x 6 in. The catalog gives a description of the Rollway pump which is particularly adapted to machine tools but can be used on any machine whether low speed, high speed or medium speed.